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ABSTRACT

How feedback affects small-group processes and group outcomes and how these outcomes vary with computer-assisted or experimenter-assisted modes of supplying feedback were investigated. Feedback theory was conceptualized through a work-emotionality framework. Theoretical constructs were operationalized through the use of Boyd's three-channel mode of communication. Experimental intervention resulted in increased perception of openness in the expression of feelings, increased interest in problem solving, improved decision-making procedures, and increased cooperation during experimentation. Groups that received feedback, both computer and experimenter-assisted, showed significant improvements in creativity and utilization of group resources. Computer-assisted feedback groups had a better short-term perception of improved cooperation and interest among group members and a greater short-term improvement in perception of decision-making procedures. In feedback groups work-emotionality activity changed in directions opposite to feedback instructions, that is, toward increased incongruency. Among the long-term effects observed in computer-assisted feedback groups were a decrease in perceived cooperation and a decrease in perceived interest in problem solving during post-experimental sessions. (Author/JY)

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COMPUTER ASSISTED FEEDBACK OF NON-INTELLECTUAL FACTORS AS A MEANS OF IMPROVING SMALL GROUP INSTRUCTION

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COMPUTER-ASSISTED AFFECTIVE FEEDBACK IN SMALL GROUP INSTRUCTION

BY

RICHARD JOHN HILL

A thesis submitted in partial fulfillment of the
requirements for the degree of

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1970

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CHAPTER I

INTRODUCTION

The Problem

Increasingly consideration is being given to affective behavior in conceptualizing the teaching-learning process. Recognition is growing that emphasis is needed on affective reactions as well as subject matter in improving instruction.[1] Despite this recognition, present attempts to individualize instruction through programed or computer-assisted instruction, give only peripheral attention to the affective domain.[2] Limited consideration of affect exists, even though research from programed instruction shows that individualized content-oriented instruction alone does not provide individuals with sufficient motivation for mastery of many subject areas.[3] Indeed, research indicates that motivation increases, and learning outcomes improve, when the social-emotional

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[1]George G. Stern, "Measuring Noncognitive Variables in Research on Teaching," in Handbook of Research on Teaching, ed. by N. L. Gage (Chicago: Rand McNally & Co., 1963), pp. 398-447.

[2]Robert M. Gagne, "The Analysis of Instructional Objectives for the Design of Instruction" (pp. 21-65), and James G. Holland, "Research on Programing Variables" (pp. 66-117), in Teaching Machines and Programed Learning II, ed. by Robert Glaser (n.p.: Department of Audiovisual Instruction, National Education Association of the United States, 1965).

[3]James Hartley, "Social Factors in Programmed Instruction: A Review," Programmed Learning, III, No. 1 (1966), 3-16.

dimension is considered in the teaching-learning process.[1] Because of the importance of the social-emotional dimension in small group instruction, findings regarding affect have stimulated research on small instructional groups.[2] The present study combined emphasis on affective components in small group learning with the conventionally individualized technique of computer-assisted instruction. The computer was introduced into the social-emotional dimension of the small problem-solving group. An experiment was conducted to determine whether the computer could supply inter-member affective feedback within the small, adult, learning group so as to enhance instructional processes and learning outcomes.

Background to the Study

Past research findings are encouraging for the further study of the affective feedback on groups. The literature indicates that affective feedback given to groups tends to improve group functioning. Affective feedback, with certain qualifications, leads to improved affective relationships within small groups, to improved small group problem-solving processes, and to improved learning outcomes.[3]

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[1]John Withall and W. W. Lewis, "Social Interaction in the Classroom," in Handbook of Research on Teaching, ed. by N. L. Gage (Chicago: Rand McNally & Co., 1963), pp. 683-714.

[2]"Group Processes," in Encyclopedia of Educational Research, ed. by Robert J. Ebel (4th ed., London: Collier-Macmillan, Ltd., 1969), pp. 551-59.

[3]Dorothy Stock, "A Survey of Research on T-Groups," in T-Group Theory & Laboratory Method, ed. by Leland A. Bradford, Jack R. Gibb, and Kenneth D. Benne, (New York: John Wiley and Sons, Inc., 1964), pp. 395-441.

In spite of encouraging results from studies of affective feedback to groups, an extensive search of the research literature uncovered no studies of feedback to small groups through the use of the computer. Studies of computer-assisted instruction (CAI) focus on content mastery through one-to-one communication between computer and student. In fact, CAI stresses individualization of learning by tailoring instruction to the unique response history of the pupil.[1] This orientation neglects the interpersonal dimension in learning and fails to consider affective responses of students as components in the learning process.

While CAI has apparently not been attempted with small groups, programed instruction (PI), the basic methodology underlying CAI has been applied successfully in several group learning experiments. Group applications of PI have included feedback considerations.[2] If programed instruction including feedback has been shown to have certain benefits in group learning, it follows that programed instruction as part of computer-assisted instruction would be a logical direction for group research. Beneficial effects of affective feedback to groups bring further encouragement for a study of computer-assisted affective feedback to small problem-solving groups.

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[1]Patrick Suppes, "The Uses of Computers in Education," Scientific American, September, 1966, pp. 207-08.

[2]James Hartley, "Some Factors Affecting Student Performance in Programmed Learning," Programmed Learning and Educational Technology, V, No. 3, (1968), pp. 206-18.

The Theoretical Framework

The theory which is being tested in the present research is the feedback loop. The feedback loop involves examination of the effects of returning information to an ongoing system concerning that system's functioning. There are two central questions in this study related to the feedback loop in groups: What are the educational outcomes of supplying affective feedback to small problem-solving groups?; and, How do these outcomes vary under conditions of computer-assisted and experimenter-assisted feedback?

Feedback is conceptualized in a work-emotionality framework. Three integrated types of constructs are specified through use of this framework: communication variables, group behavior variables, and individual behavior variables. While work-emotionality theory is not itself being tested, the theory does provide a useful operational framework for examining the feedback loop in relation to small problem-solving groups.

The three types of constructs are operationalized through a paradigm of communication developed by Boyd. Through use of Boyd's model, feedback is defined and supplied to small problem-solving group members. Individual and group educational outcomes are analyzed according to thirteen hypotheses.

The Experiment

Ninety-six students in a course in the School of Education were used as subjects for a study of computer-assisted affective feedback to small problem-solving groups. During the first class meeting of the semester, the subjects were randomly assigned into

twelve groups of eight students. Groups of eight metweekly throughout the semester and worked on tasks dealing with the course subject matter. Small group instruments were administered during each small group meeting. These instruments were also employed during experimental sessions, thus making it possible to make extensive comparisons between pre-experimental, experimental intervention, and post-experimental meetings.

During the semester, each group of eight was scheduled for an evening three-hour experimental session. A Q-sort was administered during the eighth week of class in preparation for this session. During the experimental sessions, eight-man groups were divided randomly into a four-man experimental and a four-man control group. Paired groups of four were matched, in that each set had an identical history and phase development.

The matched sets were divided into two arrangements. In one arrangement, one group of a matched set received computer-assisted feedback, while the other group received no feedback. In the other arrangement, one group received hand-calculated feedback, and the other group received no feedback. Thus two types of experimental groups and two types of control groups were used in the research. One experimental group received affective feedback from computer typewriters. A second experimental group received identical feedback compiled by hand by an experimenter. One control group entered affective reactions into computer typewriters but received no feedback. A second control group wrote affective reactions on typed sheets by hand but received no feedback. Comparisons between machine-administered feedback, hand-calculated feedback, and the two control conditions were made for eleven hypotheses. Three hypotheses compared feedback and no feedback subjects.

The experimental session began with the administration of a semantic differential test. Immediately following the test, matched sets of four subjects received an incomplete case study. Each subject rank-ordered the given solutions, after which members interacted and determined a group rank-order solution. At the end of thirty minutes, all groups were stopped, and both the individual and group solutions were collected by the experimenter.

Members of all groups then responded on four instruments which analyzed their immediately preceding group interaction. In all four types of experimental and control groups, each subject then expressed affective reactions to every other subject. Affective ratings were either entered into computer typewriters or written by hand onto pre-printed sheets.

In one type of four-man experimental group, the computer tabulated the data and let everyone know by means of the typewriters how everyone else felt about his behavior. In the other type of experimental group, identical feedback information was supplied by an experimenter who analyzed and hand-tabulated ratings. Control groups performed the same rating procedures as experimental groups -- either on computer typewriters or by hand -- but received no feedback.

Both types of experimental groups then discussed the feedback for ten minutes. Their directions were to use feedback information to improve group interaction on a second case study. After filling out all the instruments, control groups moved directly to the second case study.

All groups of four, experimental and control, worked on a second similar case study for another thirty-minute period. Subjects arrived at individual, and then group rank-order solutions. At the completion of the problem session, all group members again responded on four instruments analyzing their problem-solving session. All subjects once again expressed affective reactions to all other subjects, either through computer typewriters or on pre-printed sheets. No feedback was supplied to any group. A second semantic differential test completed the evening's activities.

Groups of eight continued to meet throughout the remainder of the semester. During these meetings groups continued to fill out small group instruments used during experimental intervention.

Outcomes from Hypotheses

Eight test instruments were used in analyzing feedback effects. Effects were investigated for four groupings of four-man groups: computer assisted feedback groups, hand-calculated feedback groups, and their two corresponding no-feedback control conditions. Differences were expected between the feedback and no-feedback conditions only.

Hypotheses proposed fourteen outcomes from supplying affective feedback to groups:

Feedback given to all members of small problem-solving groups of adults concerning group members' affective reactions to behavior during group problem-solving sessions will result in:

. . . improved group decision-making procedures in similar future group problem solving

. . . increased openness in expression of feelings by group members in similar future group problem solving

. . . improved feelings of cohesiveness for group members in similar future group problem solving

. . . perceptions by group members of more solutions to problems for similar future group problem-solving tasks

. . . less difficulty for group members with similar future problem-solving tasks

. . . increased cooperation among group members in reaching problem solutions in similar future group problem solving

. . . increased interest by group members in similar future problem-solving tasks

. . . improved group creativity when working on similar future problem-solving tasks

. . . an improved group product when working on similar future problem-solving tasks

. . . improved utilization of group resources by group members when working on similar future problem-solving tasks

. . . an increase in satisfaction among group members with the behavior of others in similar future group problem solving

. . . a change in the amount of activity by group members in directions indicated by feedback reports of all group members

. . . positive change in the dimensions of the meaning of "small group experience" for group members

. . . a shift in basic assumption culture toward pairing in similar future group problem solving

CHAPTER II

REVIEW OF THE LITERATURE

Theoretical Approaches to Group Study

Introduction

Communication, group, and individual variables were used in studying the effects of affective feedback on classroom groups. Several theorists have conceptualized these variables and have contributed to the current research.

Theoretical Influences

Field Theory

Kurt Lewin,[1] as one of the founders of field theory, developed a theoretical system outlining individual variables and extending these variables into conceptions of group level functioning.

Lewin used geometrial topology in describing the psychological world, or life space of individuals. Life space consisted of a series of multi-dimensional regions which were attractive -- had positive valence -- or were unattractive -- had negative valence -- for the individual. Lewin pictured states of tension or psychological need in which individuals moved or locomoted within life space to satisfy

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[1]Kurt Lewin, Field Theory in Social Science (New York: Harper & Brothers, 1951).

these needs. Movement tended toward goals and areas of positive valence, and away from areas of negative valence.

Lewin adapted his individual variables directly to small group functioning. Groups were composed of members with a common or shared life space. Groups had purposes and goals and tended to move or locomote toward areas of positive valence and away from areas of negative valence in achieving goals.

Lewin's theoretical contributions of an emphasis on the perceptual-psychological field, an integration of individual and group levels in small group theorizing, and a stress on valence were influential in this research.

Cognitive Consistency Theory

In 1944 Heider,[1] influenced by Lewin's conception of conflict, presented the basis for balance theory. The work of both Heider and Lewin evolved into what is currently known as cognitive consistency theory.

Three major paradigms of cognitive consistency theory have been developed:[2] the congruity model, represented by Osgood and Tannenbaum, the balance model, recently updated by Abelson and Rosenberg, and dissonance theory, as described in the work of Festinger.

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[1]Fritz Heider, "Social Perception and Phenomenal Causality," Psychological Review, LI (1944), 358-74.

[2]Roger Brown, Social Psychology (New York: Free Press, 1965), pp. 549-609.

These three paradigms make the common assumption that human beings abhor incongruity-imbalance-dissonance or what can generally be called inconsistency. Psychological disequilibrium brought about by inconsistency initiates change. Change is in the direction of psychological equilibrium, restoration, or consistency.

Cognitive consistency theorists provide theoretical and experimental evidence for the analysis of inconsistent experience. The work of these men has been taken into account in that in this experiment affective feedback provides each group member with awareness of the incongruity he arouses in the experience of others.

Theory of Groups

Among the most comprehensive and exhaustive analyses of small group functioning is George Homans' theory of groups.[1] His conceptual framework integrates individual and group level variables and attempts to isolate affective components of behavior.

Homans feels three elements describe individual human behavior. Activities refer to the things people do to or with non-human objects or with other people when their reaction or reciprocal behavior is ignored, such as driving a car or cutting someone's hair. Sentiments are feelings, attitudes, and beliefs which constitute the inner state of a person such as happiness, conservatism, or other subjective perceptions. Interaction is behavior directed toward another person when

[1]George C. Homans' theory was originally developed in his book The Human Group (New York: Harcourt, Brace, 1950), and later amplified in his work Social Behavior: Its Elementary Forms (New York: Free Press of Glencoe, 1962).

his reaction or reciprocal behavior is taken into account, such as going somewhere with someone or teaching. Homans postulates that interaction, sentiment, and activity are dynamically interrelated so that a change in one leads to a change in the others.

He further identifies a social system as the state of relations among interaction, activity, and sentiment among a collection of two or more persons identifiable as a unity, or group. A social system has two components. The external component describes the relations among interaction, activity, and sentiment developing in the group from forces in the environment. The internal component describes relations among activity, interaction, and sentiment evolving spontaneously as a product of the unique qualities of the group members.

Homans' comprehensive theory has integrated individual characteristics and group functioning and has included, with his concept of sentiment, an analysis of affective behavior. This study assumes such an integration of individual and group behavior, and places emphasis on affective variables.

FIRO Theory

William Schutz' theory of interpersonal functioning[1] deals in depth with emotional interaction patterns and their effect on group behavior. Individual emotional needs are integrated into a theory of group activity.

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[1]William C. Schutz, FIRO: A Three Dimensional Theory of Interpersonal Behavior (New York: Holt Rinehart, 1958).

In his research, Schutz factor analyzed scores on seventy items descriptive of individual behavior in groups. Three factors emerged which he named inclusion, control, and affection. Schutz described these factors as individual interpersonal needs. He postulated that every individual has the three interpersonal needs: inclusion, control, and affection. Individual uniqueness among these needs develops from early individual experience in interpersonal relations.

Inclusion refers to satisfactory relations with people in regard to interaction and association. Control refers to satisfactory relations with regard to power and status. And affection refers to satisfactory relations with regard to love. Schutz feels that these three individual interpersonal needs constitute a set of areas sufficient for prediction and explanation of interpersonal phenomena.

Schutz developed an instrument to measure people's orientation toward interpersonal activity. FIRO-B measures the behavior of a person toward others and the behaviors a person expects from others toward himself in the areas of inclusion, control, and affection. FIRO-B scores became a basis for prediction.

From analysis of individual interpersonal needs, Schutz developed conceptions of compatibility among group members. His experiments showed his predictions to be valid. Compatible groups were more productive, more cohesive, and showed increased desire for personal contact among group members than control groups.

Schutz broadened his theory through identification of group level concepts. He conceptualized roles, norms, sanctions, situational factors, and group phase development.

FIRO theory provides an integrated approach to affective behavior. Schutz has successfully described affect in terms of the individual and has extended this analysis to group level variables. Such a perspective on affect is assumed in this research.

Interaction Process Analysis

The starting point of Robert Bales' research[1] derives from two major interrelated concepts: interaction and situation. Interaction refers to human activity addressed to persons and things, and situation refers to the self, other individuals, and physical objects toward which human activity is addressed. Bales feels the observation of social interaction and its situation is a common starting ground for the social sciences. Bales research has focused on interaction within small problem-solving groups.

In small groups, Bales sees interaction as being distributed over time and among individuals. Individual acts differ in the degree to which they emphasize cognitive (symbolic manipulation), affective (emotional and evaluative content), and conative (decisions about objects and attempts at withdrawal, adaption, change, or control of the objects) aspects.

From considerations of these problems of cognitive, affective, and conative orientation, Bales has developed a category system for analyzing group interaction. His system consists of twelve categories -- six of which deal with social-emotional behaviors, and six which

[1]Robert F. Bales, Interaction Process Analysis (Cambridge, Mass.: Addison-Wesley Press, Inc., 1950).

deal with task behaviors. Bales divides group interaction into units. A unit is the smallest segment of verbal or nonverbal behavior which can be classified by the category system. He then classifies acts within his exhaustive categories.

Bales major contribution to this study has been his paradigm for a category system which classifies units of small group interaction along social-emotional and task dimensions. Problems with Bales' classification arise, however, because his system codes a behavior as social-emotional or task, depending on which component predominates. The present research emphasizes both aspects for a unit of activity.

Implications

The feedback loop involves the effects of returning information to an ongoing system concerning that system's functioning. In this research, a small group theoretical framework was needed through which small group functioning could be integrated with conceptions of the feedback loop.

A series of theoretical developments, as outlined from the literature, have contributed toward the thinking in this study. From these developments, a small group theoretical framework was sought which could examine individual and group outcomes in light of affective information returned to a group concerning that group's functioning. While not itself tested, such a small group theoretical framework would permit an operational organization of past research findings and the variables in this study. This organization could help to clarify research on the feedback loop with small groups.

The Chosen Theoretical Framework

Work-emotionality theory was chosen as a framework for examining the integration of small group variables with the feedback loop. Work-emotionality theory, while not being tested itself, did provide a useful operational framework for examiing group functioning in relation to the feedback loop.

The origins of work-emotionality theory are found in the pioneering work of W. R. Bion.[1] Bion, an English psychiatrist, developed the original concepts while working with therapy groups at the Tavistock Clinic in England. He observed that patients interacted during therapy in accordance with specific patterns of behavior toward one another, as well as toward the therapist. The group was seen as dealing with two major factors of group life -- cognition and emotion. Behavior leading toward a cognitive task, or goal, was designated as work. Work[2] was defined as ". . . the consciously determined, deliberative, reality-bound, goal seeking aspects . . ." of behavior.[3] The handling of problems of emotion was termed emotionality.

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[1]W. R. Bion, Experiences in Groups (New York: Basic Books, Inc., 1961).

[2]Technical terms are underlined when first defined and at other points where definitions are crucial for full technical understanding.

[3]Dorothy Stock and Herbert A. Thelen, Emotional Dynamics and Group Culture (New York: New York University Press for National Training Laboratories, 1958), p. 13.

Emotionality was defined as behavior which is ". . . non-purposive, 'instinctual', and not under conscious control."[1] The predominant emotional state in the group was a combination of affective need and orientation toward the goal of work. Such a predominant emotional state within the group was referred to as the basic assumption culture of the group.

Bion identified three cultures: dependency, pairing, and fight-flight. To Bion, cultures differed in emotionality orientation only. He did not distinguish between levels of work. In a work-dependency culture, a group was looking for direction and support from a source outside itself. For example, support could be expected from an authoritarian teacher, or a group leader. In a work-pairing culture, the group was functioning so that its strength arose through close relationships among the membership. In a fight-flight culture, the group was either attacking an object of concern, or withdrawing from it. For example, members could attack a leader verbally, or withdraw from his direction by lapsing into silence.

Herbert A. Thelen[2] incorporated Bion's basic concepts into his research at the University of Chicago Human Dynamics Laboratory

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[1] Ibid.

[2] The primary sources of Thelen's contribution to work-emotionality theory are: "Emotionality and Work in Groups," in The State of the Social Sciences, ed. by Leonard D. White (Chicago: University of Chicago Press, 1959); "Work Emotionality Theory of the Group as an Organism," in Psychology: A Study of a Science, ed. by Sigmund Koch (New York: McGraw-Hill, Inc., 1959), and, Stock and Thelen, Emotional Dynamics and Group Culture.

and integrated Bion's ideas into an educational context. Thelen's major contribution has been to further refine Bion's theory.

Thelen and his associates divided Bion's unitary conception of work into four distinct levels:

1 - level work is personally need-oriented and unrelated to the group work
2 - level work is maintaining or routine in character. It may involve attempting to define a task, searching for methodology, clarifying already established plans, and the like
3 - level work is group-focused work that introduces some new ingredient; active problem solving
4 - level work is highly creative, insightful, and integrative. It often interprets what has been going on in the group and brings together in a meaningful way a series of experiences[1]

They also identified five types of emotionality. They separated fight from flight and added counter-dependency. Only four of these emotionalities -- fight, flight, pairing, and dependency -- were treated in any detail in their work. Counter-pairing, refined by Boyd and his colleagues at the University of Wisconsin, did not appear in the work of Thelen.[2] There have thus been identified six types of emotionality:

Fight - expressions of hostility and aggression
Flight - expressions of avoidance of the problem or withdrawal from participation
Pairing - expressions of warmth, intimacy, and supportiveness
Dependency - expressions of reliance on some person or thing external to the membership

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[1]Stock and Thelen, p. 193. More detailed descriptions of work levels are found in Appendix A.

[2]Eugene R. Watson, "The Dynamics of Expectations and Adaption to Adult Learning Group Cultures" (unpublished Ph.D. dissertation, University of Wisconsin, 1963), p. 28.

Counter-dependency - expressions of concern over threat to personal autonomy resulting from reliance upon one of a group of individuals for direction, upon subject matter, or upon a rigid methodology

Counter-pairing - expressions which indicate there is a desire for formality, detachment, or simply a rejection of any pairing or friendliness with others[1]

The Thelen team developed operational methods for analyzing work and emotionality behaviors in terms of individuals and groups. They also conducted extensive research into work-emotionality behavior in small problem-solving classroom groups.

In addition, Thelen further refined Bion's conception of group culture. He stressed "group-as-a-whole validity,"[2] in which the group itself could be described as having characteristics distinct from analysis of individual group members. The predominant work-emotionality behavior found in a group at a point in time was called, by Thelen, the basic assumption culture of the group. The basic assumption culture represented a social system which provided orderliness and stability within the group. The major work-emotionality modality (group basic assumption culture) which the group assumed provided a constancy of expectation, so that individuals could predict the consequences of their behavior. The group culture shifted over time as different work-emotionality behaviors became the major concern of the group.

The relationship between the individual and the group culture is described by Thelen when he says:

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[1]Ibid. More detailed descriptions of emotionalities are found in Appendix A.

[2]Stock and Thelen, p. 9.

> The characteristics of the group then -- the group factors -- emerge from the patterning of the interactions in which each person engages; at the same time, this emergent group effects the interactions in which each person engages. Thus, the persons construct the group at the same time the group exercises control over the behaviors out of which it is constructed. The group is a system of part-whole relationships. The parts are the tendencies inhering in the individuals; and the whole is the social system they create through the expression and exercise of these tendencies.[1]

Boyd's position[2] is that there exists a polarity continuum for the emotionalities fight, pairing, and dependency. The polarity of fight is flight. Watson stressed counter-dependency as the polarity of dependency, and counter-pairing as the polarity of pairing.

Boyd[3] further stressed the idea that work and emotionality behaviors are inseparable. Reality bound goal seeking behavior and instinctual non-purposive behavior are in constant dynamic interaction during group activity. All group activity has components of both. Thus work-emotionality theory allowed all group behavior to be defined by a matrix of twenty-four behavior types. Group interaction can always be conceptualized as a combination of one of the four levels of work and one of the six types of emotionality. One of these combinations will predominate in group functioning. Group culture can thus be any one of twenty-four distinct work and emotionality behavior types.

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[1] Ibid.

[2] Robert D. Boyd, "An Interaction Model Applied to Supervision" (paper presented at the meeting of the Association for Supervision and Curriculum Development, Denver, Colorado, April 23, 1966), p. 28.

[3] Ibid., p. 11.

Slater[1] suggests a developmental view of basic assumption cultures within groups. To Slater, the work-emotionality basic assumption cultures are mechanisms which all serve the same purpose. Cultures are attempts to maintain a balance between individual and group identity. As there is increasing consciousness of, and involvement in, the situation by members, different basic assumption cultures tend to predominate within the group. Increasing awareness of individual identity, group identity, and group separateness by members leads to evolution of the group from fight-flight, through dependency, and into pairing cultures.

Thelen describes complications of the Slater viewpoint when he says:

> In general, we do not expect the particular sequence of work-emotionality cultures to be constant from group to group, but to depend on such factors as the particular valency characteristics of the members, the leader's personal needs and leadership approach, and task demands to which the group is subject.[2]

Slater's viewpoint of cultural development is assumed and tested in this research with Thelen's reservations in mind.

Individual behavior is conceptualized in work-emotionality theory through the idea of valency. Bion first identified valencies as describing the relationships between the individual and the group culture. For Bion valency was ". . . a capactiy for instantaneous and involuntary combination of one individual with another for sharing

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[1]Philip E. Slater, Microcosm (New York: John Wiley and Sons, 1966).

[2]Stock and Thelen, p. 190.

and acting on a basic assumption."[1] Valency was a property of the individual's personality which accounted for his participation in group life. To Bion it had two aspects. "Expressive behavior" referred to " . . . the kind of emotional disposition the individual was most likely to express behaviorally in the group" and "combining with others" dealt with the " . . . capacity of individuals to support or co-operate with others in developing, maintaining, or moving away from the various work-emotionality cultures."[2]

Thelen[3] discussed valency as an individual personality characteristic which explained the group relevant aspects of personality. Valency is defined as the pattern of internal predispositions to act in groups, which form a coherent system within personality, and determine how a person will respond and contribute in small group interaction.

In his research Thelen dissected valency and found that:

> . . . valency -- as an organized set of emotional predispositions residing in the individual -- can profitably be differentiated into three related but distinguishable elements: area of concern, culture preference, and affective approach.[4]

By area of concern Thelen means " . . . an affect laden problem, that, on some internal, possibly unconscious level is felt to be significant

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[1]Bion, p. 153.

[2]Stock and Thelen, p. 15.

[3]Ibid., pp. 19-64, 225-28.

[4]Ibid., p. 23.

by the individual and mobilizes his psychic energies."[1] Certain basic concerns of personality provide a general level of motivation for the individual in a variety of group situations. Culture preference referred to the group behavior patterns, or basic assumption cultures, which were preferred by the individual. Individuals have definite preferences for behaviors they want to see in groups. Affective approach described the " . . . ways in which the individual responds expressively to the various group cultures, that is: the ways in which he behaves and does not behave."[2] People react to various group behavior patterns in a systemic fashion. The dynamic pattern of these three aspects of valency determines how a person will behave in groups.

Thus work-emotionality behaviors, basic assumption cultures, and valency are the basic components of work-emotionality theory. Two of the three areas of individual valency -- culture preference and affective approach -- are particularly relevant to this research.

Model of Classroom Communication

In addition to basic theory, a model was needed which related feedback in a work-emotionality framework to educational outcomes in the classroom. Boyd's three channel model of communication[3] allows

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[1] Ibid.

[2] Ibid., p. 24.

[3] The original explanation of the communication model is found in Boyd, "An Interaction Model Applied to Supervision." It is more recently developed in Boyd, "Interaction: A Three Channel Model," University of Wisconsin, 1969. (Mimeographed.)

application of feedback, in work-emotionality terms, to measures of classroom activity. It was through Boyd's model that theoretical considerations were connected with observed classroom behavior. Boyd's model applied to classroom small group activity provided research data for testing.

Boyd has identified three distinct channels of communication which occur simultaneously in the classroom. The three channels are motivation, delivery style, and information.

Traditionally the channel of information is considered the forcal element for learning. Information is "what is being talked about" in the classroom. Examples would include discussion of assigned curriculum content such as history or geography, or discussion of personal feelings such as: "I am excited by this idea," or "Today's class is boring." Another example would be discussion of the processes for learning such as: "Shall we have a group discussion?" or "How shall we be tested on this material?" Information is the subject matter of class discussion.

A second channel of classroom communication is on the motivational channel. Communication of motivation refers to the expression of the basic concerns of personality. Boyd describes the communication of basic concerns when he says:

> As one listens to (and watches) a person talking to you, you begin to perceive certain concerns he is expressing. The concerns may appear in the surface flow of his conversation or discussion. They may appear just as frequently in less open vision, coming to the surface with this word or that gesture. Your acquaintance may be telling you about his work-a-day experiences and running through his accounts are consistent threads of perceived mistrust of his fellow workers. Such concerns

openly displayed or masked behind words and gestures are perceived as the motivational content of the utterance.[1]

Boyd[2] conceives of basic concerns in terms of the developmental psychology of Eric Erikson. Directly or indirectly people give expression to their underlying stage of development.

The third channel of classroom communication is the delivery style channel. Delivery style refers to the manner in which content is communicated. Content may be delivered in a variety of ways depending on voice inflection, choice of vocabulary, body posture, and bodily movement. Combinations of these factors present to the observer an emotionality and a concern for work which can be experimentally analyzed. Measures of work and emotionality behaviors of a group member become measures of his individual delivery style. Style is typified by the statement: "It is not so much what he says that irritates me, but the way in which he says it."[3]

Affect in this research is found in work-emotionality analysis in the delivery style channel of communication. Hypotheses explore the effects of work-emotionality feedback from this channel on outcomes in the information and delivery channels of communication in small group interaction.

Affect

Affective behavior in this research develops in the delivery style channel of communication in Boyd's communication model. In the

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[1]Boyd, "An Interaction Model Applied to Supervision," p. 5.

[2]Ibid., pp. 5-10.

[3]Ibid., p. 10.

delivery channel, measures of "How something is said" are expressed by a work and an emotionality orientation.

Expressive behavior in the delivery channel of communication emerges from two components of personality as identified in Thelen's conception of valency. Delivery channel behaviors in Boyd's model are expressed from the culture preference and affective approach portions of valency within individual personality.

Thelen's conception of the area of concern portion of valency expresses itself in Boyd's motivation channel of communication. For Thelen, area of concern is a significant affect laden problem on an internal and often unconscious level. Thelen went no further in refining this concept. The basic affect laden problem conceived by Thelen has been expressed by Boyd as an Eriksonian ego stage. It seems quite reasonable to assume that the area of concern portion of valency is in fact an expression of ego stage development. The ego stage development aspect of personality, as outline by Boyd, gains expression through the motivation channel of communication. Thus area of concern as defined by ego stage development is expressed in the motivation channel of communication.[1]

The ego stage or area of concern aspect of valency contains aspects of affective response. This research, however, did not deal with ego stage related affect. Such affect, though part of the area

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[1]Robert D. Boyd and David Darling, "A Study in Interaction Patterns in Instructional Teams Through the Utilization of an Interaction Model by Which to Identify and Determine the Interpersonal Relations and Decision-making Processes" (unpublished proposal for research and related activities, submitted to the U. S. Commissioner of Education, 1966).

of concern portion of valency, is primarily intra-personal. Affect was strictly defined for research purposes within the primarily interpersonal portions of valency -- culture preference and affective approach. It is these two portions of individual valency that find expression in the delivery channel of communication. Affect is investigated by analyzing affective approach and culture preference behaviors as expressed in this delivery channel of communication.

It must be recognized, however, that motivation, delivery style, and content components of communication occur simultaneously. Similarly, all three components of valency dynamically interact in forming expressive behavior at any one moment. Nevertheless, analysis of affect was possible only after segregation of delivery style, affective approach, and culture preference variables within communication and valency concepts. Such a segregation failed to take into account the simultaneous interaction of all these which will influence student response. Minimal degrees of error from this segregation are expected.

In this research, then, affect was defined as the incongruency between each subject's culture preference behaviors and the observed affective approach behaviors of each of the other subjects in the group. Individuals quantified incongruency with each other subject on three integrated nominal rating scales. Feedback occurred as all small group members received incongruency reactions to their behavior from all other group members. Affective incongruency reactions of each small group member to every other member became subject matter for

group discussion. Hypotheses propose delivery style and information channel effects as a result of discussion of feedback.

Summary

The goal of this research was to investigate what happened in the information and delivery channels of communication after small problem-solving groups received affective delivery channel feedback in the information channel of communications.

Work-emotionality theory combined with Boyd's paradigm of communication provided a framework for handling hypotheses investigating these questions. The work-emotionality framework allowed organization of individual, communication, and group variables in relation to the feedback loop. While feedback was stated in work-emotionality terms, this study did not investigate the work-emotionality theory directly. The work-emotionality framework was used only as a useful means for integrating and investigating the effects of feedback within small groups.

Feedback to Groups

Definition of Feedback

Research on feedback to groups is scattered throughout a number of fields of study. Common to these fields is the assumption that knowledge of results of individual or group behavior constitutes feedback. This study, in exploring group interaction, is concerned with looking at feedback within the context of the small instructional group. Thus, feedback will refer to information given to small instructional group members concerning individual or group cognitive or affective behavior.

Feedback in T-groups

A major source of group feedback studies is found in sensitivity training research. The lack of formal content structure to T-group interaction and the emphasis on individual feeling have resulted in a series of research efforts investigating the effects of feedback on group and individual behavior.

One focus of experimentation has been the effect of feedback on group behavior. Gibb and associates,[1] in working with ad hoc groups, found that feeling-oriented positive feedback given to T-group members improved group task efficiency and reduced defensiveness among group members more than other types of task and affective feedback given to similar groups. Replicating his own

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[1] J. R. Gibb, "Defense Level and Influence Potential in Small Groups," Research Reprint Series, No. 3 (Washington, D. C.: National Training Laboratories, 1960).

study with both ad hoc and established groups, Gibb[1] found that feeling oriented positive feedback improved group problem solving efficiency and reduced defensiveness more with ad hoc than with established groups. The author concluded that this effect was due to established T-groups having already attained a high level of good communication and task efficiency prior to the experimental sessions.

Findings of Miles[2] qualify Gibb's conclusions. In studying feedback to T-groups, Miles found that when the content of feedback dealt with warm interpersonal relationships, behavior was more responsive to change than when feedback dealt with task definition and accomplishment. However, Miles found that strong, immediate, specific, negative feedback was more effective than positive or neutral, immediate, specific feedback.

Though strong negative feedback is superior in producing immediate specific behavioral change, it does not deny that feeling oriented positive feedback given to groups improves group functioning over longer periods of time. Feeling-oriented positive feedback seems to improve group problem solving efficiency, reduce defensiveness, and bring about desirable behavioral change significantly more than other types of affective and task-oriented feedback.

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[1] Ibid.

[2] M. B. Miles, "Factors Influencing Response to Feedback in Human Relations Training" (New York: Horace Mann-Lincoln Institute of School Experimentation, Teachers College, Columbia University, 1958), cited by Stock, "A Survey of Research on T-Groups," p. 433.

Other researchers have focused on feedback in T-groups and its effects on individual behavior. Gibb[1] and his associates compared a wide range of task and affective feedback conditons with no-feedback control groups. Groups which received feedback differed from those which received no feedback. Members of feedback groups felt more favorable toward the group, displayed a higher level of aspiration for their group, and felt more free to express negative feelings than control group members.

Lubin and Zuckerman[2] extended Gibb's findings in discovering that in T-groups which had open sharing of feeling -- affective feedback -- fewer negative reactions developed among group members than in T-groups without open sharing of feeling. Negative affective reactions among T-group members were also found to be low when discussion was relevant to issues within the group, when there was conflict within the group, and when individuals were active in dealing with tasks at hand.

In a recent study Myers, Myers, and Goldberg[3] confirmed the work of Gibb, Lubin, and Zuckerman using sociometric rating instruments. The researchers found that written affective feedback made T-group members more sensitive to interpersonal phenomena within the

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[1]Gibb.

[2]B. Lubin and M. Zuckerman, "Affective and Perceptual Cognitive Patterns in Sensitivity Training Groups," Psychological Reports, XXI (1967), 365-76.

[3]Gail E. Myers, et al., "Effects of Feedback on Interpersonal Sensitivity in Laboratory Training Groups," Journal of Applied Behavioral Science, V, No. 2 (1969), 178-85.

group than control group members who received no feedback. They concluded that insight into the reactions of others to one's personal behavior significantly increases sensitivity to interpersonal phenomena.

Similar research by Lippitt[1] provided feedback to T-group members concerning the ways each person was perceived by his fellow members and the ways in which they would like him to change in terms of frequency of participation, the degree to which he welcomed or resisted the ideas of others, and the extent to which he sought attention or avoided recognition. Persons receiving feedback changed in the direction their group wanted them to change. Persons receiving no feedback showed significantly less change in behavior.

In summary, task and affective feedback given to group members leads to more favorable attitudes toward the group, higher levels of aspiration for the group, and greater openness in the expression of negative feelings. Affective feedback also increases interpersonal sensitivity within the group, and in so doing leads to fewer negative affective reactions among group members. Group member affective reactions given to all subjects were also found to change behavior in the direction described by the feedback.

A third focus in the T-group literature involves comparisons of T-groups with other types of training. While these studies do not examine feedback as such, they are indicators of feedback results.

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[1]Gordon Lippitt, "Effects of Information about Group Desire for Change on Members of a Group" (unpublished Ph.D. dissertation, American University, 1959), Dissertation Abstracts, Vol. XX, 10 (1960), p. 4200, cited by Stock, "A Survey of Research on T-Groups," p. 429.

Feedback is a major component of T-group functioning and while results from comparative T-group studies cannot be attributed to feedback directly, outcomes are indicators of feedback effects.

Tolela[1] compared T-group training and teacher-directed, discussion training. Ten T-groups which had free expression of interpersonal affective and task reactions, and ten discussion groups met for training sessions. All groups then worked on problem solving tasks. On three measures of task effectiveness, T-groups were significantly better than discussion groups. Tolela concluded that T-group training transfers to task-oriented situations and contributes to effective problem solving.

Wood and Goldberg[2] confirmed and extended Tolela's findings. They compared the effects of T-group, traditional critic-teacher, and instrumented (no leader) training on small group effectiveness. Measures were taken of group productivity, group sentiment, and group interaction. The instrumented groups in which interpersonal affective and task reactions were under least direction, and control, rated highest on group sentiment, group productivity, and group interaction. T-group members felt their groups learned more than the traditional critic-teacher groups. Traditional critic-teacher group members felt their groups had less conflict than members of other types of groups.

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[1]Michele Tolela, "Effects of T-Group Training and Cognitive Learning on Small Group Effectiveness" (unpublished Ph.D. dissertation, University of Denver, 1967), Dissertation Abstracts, Vol. XXVIII, 12-A (1968), p. 5175.

[2]R. V. Wood and A. A. Goldberg, "Effects of Three Styles of Training Upon Small Group Effectiveness: Traditional, T-Group, and Instrumented Training Styles," The Speech Teacher, XVII, Summer, 1968, 238-45.

Orsburn[1] divided eighty-four sophomores in the bottom third of their high school class, as measured by a classroom behavior scale, into six groups of fourteen. Two groups received sensitivity training with high degrees of task and affective feedback concerning individual behavior. Two groups received lecture sessions on appropriate behavior, and two groups received no treatment. T-group sessions were found to be more effective than lecture sessions or no treatment in improving classroom activity. T-group sessions were also more effective than lecture sessions or no treatment in improving congruence between perceptions of the real-self and the ideal-self.

Thus the three foci of T-group research provide evidence for the direction in which task and affective feedback change group and individual behavior. Feedback to groups improves group problem-solving efficiency and reduces defensiveness in group interaction. Feedback improves group members' attitudes toward the group and increases interpersonal sensitivity. And indications are that allowance for feedback in group activity leads to superior problem solving when compared to methods which restrict interpersonal interaction.

Results are not, however, without qualification. While positive feeling-oriented feedback is generally superior for producing effective behavioral change, strong negative feedback appears to be most suffessful in causing immediate, specific, behavioral change. In addition, feedback tends to vary in effectiveness with other

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[1]Jack D. Orsburn, "Sensitivity Training Versus Group Lectures With High School Problem Students" (unpublished Ph.D. dissertation, Kent State University, 1966), Dissertation Abstracts, Vol. XXVIII, 2-A (1967), pp. 503-04.

conditions in the group. Both minimal leader intervention and the presence of conflict within the group make group members more receptive to change through feedback.

Feedback In Small Problem Solving Groups

Several studies have explored the effects of task and affective feedback in small problem-solving groups. Scheidel and Crowell[1] analyzed the amount of affective and cognitive feedback occurring in small instructional groups. They analyzed one meeting for each of five ad hoc problem-solving groups of from four to seven college students. They found that thirty-five percent of the group discussion was devoted to feedback. Feedback was primarily task related. The researchers concluded that feedback in small problem-solving discussion groups was primarily motivated by concern for task rather than concern for social-emotional behaviors.

Jenkins[2] analyzed the effects of affective and cognitive feedback given by a non-participant observer in a small problem-solving discussion group. At the end of a discussion session the observer reported to the group how well they had stayed on the topic, the point reached in the discussion, the rate of progress by members, observations on atmosphere, and improvements over past sessions. The group used this feedback as data for discovering and correcting difficulties during self-evaluation prior to a second discussion

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[1]T. M. Scheidel and L. Crowell, "Feedback in Small Group Communication," Quarterly Journal of Speech, LII (October, 1966), 273-78.

[2]D. H. Jenkins, "Feedback and Group Self-evaluation," Journal of Social Issues, II (1948), 50-60.

session. Jenkins concluded that the observer and his feedback were a valuable tool in improving group self-evaluation and performance.

Shaw and Blum[1] found that small task-oriented groups are more effective (show better task performance) when group members are aware of valid individual member satisfaction. This effect is greater the more difficult the task the group is expected to perform. A further investigation by Shaw and Caron[2] showed that valid communication of group member dissatisfaction leads to improved group effectiveness (better task performance). Again this effect is greater the more difficult the group task.

Shelley[3] studied task result feedback to successful and unsuccessful small problem-solving groups. Members of successful groups showed a more positive outlook toward future group problem solution. Success group members also tended to see greater group unity, reported receiving more help from the group, and felt greater preference for working with the same group in the future.

In studying a series of small problem-solving groups, Frye[4]

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[1]M[arvin] E. Shaw and J. Blum, "Group Performance as a Function of Task Difficulty and the Group's Awareness of Member Satisfaction," Journal of Applied Psychology, XLIX (June, 1965), 151-54.

[2]Marvin E. Shaw and Paul Caron, "Group Effectiveness as a Function of the Group's Knowledge of Member Dissatisfaction," Psychometric Science, II, No. 19 (1965), 299-300.

[3]H. P. Shelley, "The Role of Success and Failure in Determining Attitude Toward the Group as a Means to Member Goals," Conference Research Project Report (Ann Arbor, Michigan: University of Michigan, 1950).

[4]Roland Frye, "The Effect of Orientation and Feedback of Success and Effectiveness on the Attractiveness and Esteem of the Group," Journal of Social Psychology, LXX, No. 2 (1966), 205-11.

related feedback on group task effectiveness and individual influence to group and individual outcomes. After each of nine ranking problems, each of forty-eight groups received feedback on group task effectiveness and individual member influence within the group. Through supplying group task effectiveness feedback, Frye found that individuals were attracted to groups and esteemed other members of groups which successfully solved task problems. Frye also found that individual self-esteem was directly related to feedback on member influence within the group. The degree to which a member influenced group decisions determined his esteem for self within the group, regardless of whether that influence led to group success or failure with the task.

These studies show that in small problem-solving groups both task and affective feedback improve group productivity and improve members' attitudes toward the group and toward future participation in the group.

Again, feedback effectiveness seems to vary with conditions within the group. Task difficulty appears to affect feedback effectiveness. As difficulty increases, the effectiveness of affective feedback in improving task-related behavior appears to increase. In addition, feedback indicating member influence within the group affects member self-esteem irrespective of other types of feedback supplied. Increased influence increases self-esteem.

Feedback to Groups through Video Tape

A recent development in the area of feedback to groups has been the use of video tapes. By providing an objective picture of

group interaction, video tapes give feedback to subjects over the full range of their behavior -- both task and affective.

In group and family psychotherapy, several studies[1] have taped therapy meetings. The tapes have been played back to groups as feedback and as a source of data for further sessions. Results have shown that feedback helps group members to see themselves more objectively, makes problems clearer to subjects, and makes people aware of the multiple channels of communication which exist in human interaction. Video tape was found to focus the attention of patients and give them an objective picture of themselves with no biased feedback from others. These studies reveal improved short-term behavioral change as a result of taped feedback data. However, analysis of long-term change in relation to feedback is needed.

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[1]Recent studies of taped group and family psychotherapy sessions include: Ian Alger and Peter Hogan, "The Use of Videotape Recordings in Conjoint Marital Therapy," American Journal of Psychiatry, CXXIII, No. 11 (1967), 1425-1430; A. A. Alkire, "Use of Videotaped Playback in the Fields of Education and Mental Health," AV Communication Review, XVII (Summer, 1969), 187-95; Burton Danet, "Self-confrontation in Psychotherapy, Reviewed," Journal of Psychotherapy, XXII, No. 2 (1968), 245-57; J. J. Goldstein, et al., "A Method for Studying Social Influence and Coping Patterns Within Families of Disturbed Preadolescents," The Journal of Nervous and Mental Disease, CXLVII (1968), 233-51; Morton Perlmutter, "Family Diagnosis and Therapy Using Videotape Feedback in Group Psychotherapy," American Journal of Orthopsychiatry, XXXVII, No. 5 (1967), 900-05; and, Arthur Rogers, "Videotape Feedback in Group Psychotherapy," Psychotherapy, V, No. 1 (1968), 37-39.

Stoller[1] and Bradford[2] have explored the use of video tapes in sensitivity training groups. As with psychotherapy outcomes they found video tape feedback helpful in its ability to provide immediate recovery and review of a large amount of objective data concerning interaction. Tapes allowed subjects to see themselves as others see them and to confront themselves for the first time, instead of confronting information filtered through other individuals. Subjects were able to compare anticipated and actual response and see the discrepancy between their inner state and what they communicated to others. Immediate behavioral change in the direction of greater congruency between expected and actual behavior occurred in group interaction, often before such change was incorporated into the self-concept.

Although only partially investigated to date, video tape is effective in supplying task and affective feedback to therapy groups and T-groups. Tape studies help group members to see themselves more objectively. Such objectivity makes problems more readily available and more clear to subjects. In addition, video tape feedback brings short-term changes in behavior.

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[1]Frederick H. Stoller, "The Use of Focused Feedback Via Videotape in Small Groups," ERIC: Clearinghouse on Adult Education, Human Relations--Training and Research No. 1, National Education Association Research Report (Syracuse, New York: National Training Laboratories, n. d.), p. 12.

[2]David Bradford, Research studies in progress. University of Wisconsin, 1969.

Feedback to Groups: Long-Term Effects

There are, in the small group literature, studies which show long-term changes in behavior after research involving feedback. The most relevant review of such studies has been done by Watson[1] who summarized the literature on long-term changes in behavior after T-group sessions. Watson reviewed works which looked at behavioral changes in T-group subjects for from one week to a year after training. His review of approximately fifty studies showed significant long-term change in behavior after sensitivity training in seven areas:

1. Increased awareness of self in interaction.
2. Increased accuracy of perception of the feelings and overt behavior of others.
3. Increased openness in interpersonal relationships.
4. Increased acceptance of differences in others.
5. Decrease in extreme interpersonal need orientations, in the areas of control, inclusion, and affection.
6. Increased understanding of group behavior, and skill as an effective, flexible group leader, or interdependent group member.
7. Increased self-confidence in interaction.[2]

Studies such as Watson's present a serious problem of inference. For while feedback is certainly a major component of sensitivity training, the changes which Watson reports cannot be accorded to feedback directly. Though indicative of long-term feedback effects, the studies he reviews do not relate feedback outcomes as such to long-term change; outcomes cannot be causally linked to feedback. Specific

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[1]Eugene R. Watson, "Interpersonal Changes Through Immediate Feedback Approaches," Adult Education, XIX, No. 4 (Summer, 1969), 251-67.

[2]Ibid., p. 263.

feedback variables are too contaminated by other variables to report direct results. Inferences about feedback could not be justified from the specific data gathered.

Controlled studies are needed. Feedback as a variable to be studied needs to be administered to experimental groups and not to control groups. Specific dependent measures for both groups must then be examined over time to determine longitudinal feedback effects.

Summary

Affective and task-oriented feedback supplied to group members improve both individual and group functioning. Groups receiving feedback show improved problem-solving efficiency, improved productivity, and a reduction in defensiveness within the group. Feedback will produce behavioral change in group members. Change will be in the direction indicated by the feedback, in directions considered desirable by others, and in directions making external behavior increasingly congruent with internal states. Feedback will increase group member interpersonal sensitivity and cooperation, and will tend to bring about more favorable attitudes toward the group and toward future group functioning.

These effects of feedback must be qualified by conditions within the group. Minimal leader intervention and conflict within a group will tend to improve the effectiveness of feedback in producing behavioral change. Feedback on member influence within the group will, additionally, affect member self-esteem irrespective

of other types of feedback supplied. Task difficulty also tends to influence effectiveness of affective feedback. It appears that as task difficulty increases, the effectiveness of affective feedback in improving task-related behavior tends to increase. And while short-term behavioral change in individuals and groups as a result of feedback has been established, long-term change needs controlled exploration. Related research, however, seems to indicate that feedback to groups produces long-term behavioral change. Type of feedback must also be considered in evaluating feedback effects in groups. While positive feeling-oriented feedback is generally desirable for producing effective behavioral change, strong negative feedback appears to be most successful in causing immediate, specific, behavioral change.

Implications

Studies of feedback to groups appear in a wide range of subject areas. The types of feedback and the measures of dependent outcomes also show wide variation. Variation appears to exist because most group feedback research is not studying feedback directly. Feedback is usually an ingredient in a different question. These limitations prevent studies of feedback from moving in a singular coherent direction. As a result, implications for new research involve inferences rather distant from specific measures of data.

Additionally, studies in the subject areas reviewed, all approach feedback from a slightly different perspective. Definitions

of feedback vary widely with the specific aim of different research. Affective and task components of feedback are combined in a variety of ways, depending on the hypothesized outcomes of specific experiments.

Common to all definitions of feedback, however, is the information loop. Feedback is always viewed as the return of information to a system concerning that system's functioning. The system may be an individual or a group, and the information may be in a variety of forms. However, all feedback concerns data supplied to a system concerning that system's activity.

Other problems for this research relate to questions not investigated in the literature. Studies indicating the long-term effects of feedback to groups were not found directly. Does feedback to groups change group behavior over time? Related research points to a positive answer, but controlled experiments measuring specific feedback effects are needed. Long-term effects are particularly important to an educational study of group affective feedback, for it is generally assumed that education produces long-term change. Measures of change over time are made in the current study.

Another only marginally explored question is the interrelationship between task and affective feedback. It appears that specific feedback measures and dependent outcomes as found in the literature are many times vague as to the exact combinations of affective and task content. While some inferences relating affective feedback to task and affective outcomes are possible, these inferences

are often questionable. Sufficient segregation has not been made of affective and task feedback, and corresponding affective and task outcomes, to allow clear conclusions on their interrelationships. This study uses a model which attempts to clearly differentiate affective feedback, and corresponding affective and task-related outcomes.

In spite of these limitations within the literature, feedback and feedback outcomes in this research are close enough to measures in the literature to allow for meaningful implications. In this research outcomes in the information channel of communication are in close agreement with task-related behavior in the literature. Effects in the delivery channel of communication agree with affective behavior in the literature, and affective feedback in this research is similar to reported affective feedback.

Of thirteen hypotheses explored, past studies speak directly to six. The literature indicates that affective feedback to small problem-solving groups should bring the following task or information channel outcomes: improved group problem-solving efficiency, improved group productivity, increased cooperation among group members and increased interest in task by group members. Affective feedback should also produce the following affective or delivery channel outcomes: increased openness as to feelings by group members and increased cohesiveness within the group. The other seven hypotheses are not supported by past research evidence.

Instructional Uses of the Computer

Definition of Computer-Assisted Instruction

Computer-assisted instruction (CAI) includes all applications of computers to the teaching-learning process which help to achieve educational objectives. CAI involves three elements: the student, the computer, and software allowing interaction between the two. Descriptions of computer-assisted instruction generally assume direct, "on line" interaction between the student and the machine. Interaction may be through a simple typewriter, or through a complex student terminal, including a cathode ray picture tube, a typewriter, a slide screen, earphones, and a touch sensitive light pen. While indirect communication between student and computer, such as submission of a card deck to solve statistical problems, is CAI in the broadest sense, it is assumed here that computer-assisted instruction includes only "on line" interaction between student and machine by means of computer software which helps to achieve educational goals.

The literature on CAI varies in its focus. Some articles stress computer hardware configurations describing variations in the types of student terminals and types of computers that control these terminals.[1] Others emphasize types of software or computer programs

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[1]International Business Machines Corp., Federal Systems Division, Report for the U. S. Continental Army Command, Fort Monroe, Virginia, February, 1968, A Feasibility Study of Computer Assisted Instruction (Gaithersburg, Maryland: International Business Machines Corp., Federal Systems Division, 1968).

which have been written for instruction.[1] The focus of this review is in neither of these directions. The emphasis is rather on the transactional phase of student-computer interaction. Focus is placed on the instructional strategies which have been developed for CAI. Instructional strategies refer to the rules governing the interaction between the student and the computer.

Instructional Strategies of Computer Assisted Instruction

Nine instructional strategies have been identified in the literature on CAI. Suppes[2] describes the simplest strategy as the drill and practice system. Such systems are supplements to a regular curriculum taught by a teacher. Time is set aside each day for students to practice individually at terminals in direct communication with the machine. Suppes[3] describes his drill system for mathematics as having several tracks or programs of varying difficulty. At the end of each day's drill, a student's progress is evaluated and the level or track is adjusted up or down for the next day's session. Atkinson stresses that drill and practice systems for each specific day:

> . . . present a fixed, linear sequence of problems. Student errors may be corrected in a variety of ways, but no real-time decisions are made by the computer

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[1]Karl L. Zinn, "Computer Technology for Teaching and Research on Instruction," Review of Educational Research, XXXVII, No. 5 (December, 1967), 618-32.

[2]Suppes, pp. 214-17.

[3]Ibid.

for modifying the flow of instructional material according to the student's response history.[1]

A wide variety of drill and practice systems are now in use.[2]

Drill and practice systems allow two possible types of response from the pupil. Programs will include either multiple choice responses or uniquely constructed responses in which the student selects from a large set of possibilities an answer already uniquely determined by the exercise. Drill and practice programs are controlled by the author rather than controlled by the student, and they are fixed in linear presentation of material.

The second pattern of student-computer transaction described by Suppes[3] is the tutorial approach. In the tutorial method the goal is to take over from the classroom teacher the main responsibility for instruction. These programs have more of an instructional component than drill and practice systems. Emphasis is placed on learning new or additional material not presented in the classroom, and tutorial programs include a variety of information displays in addition to testing and drill exercises. Complex tutorial systems involve a series of student terminals for individualized instruction.

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[1]Richard C. Atkinson, "Computerized Instruction and the Learning Process," American Psychologist, XXIII, No. 4 (April, 1968), 225.

[2]Zinn, p. 619.

[3]Suppes, pp. 217-19.

In addition tutorial programs:

> . . . have the capacity to modify the sequence of instructional material on the basis of a single response or some subset of the student's response history.[1]

Thus real time decisions are made by the computer, which change the student's path through the curriculum being taught.

Hickey[2] distinguishes between two types of tutorial programs. He speaks of intrinsic logic programing, in which each future stimulus presentation is determined by the student's immediately preceding response. And he outlines adaptive logic programing, in which the choice of each future stimulus is determined by a series of previous responses or by other prior behavior. Thus a complex response history or a priori data such as results of achievement, personality, or aptitude tests can determine future stimulus sequences.

Possible responses by the students in the tutorial mode are again either multiple choice or uniquely constructed responses determined by the exercise. Although paths through the material being taught are determined by student response, any path in itself is controlled by the author as opposed to being controlled by the student. Tutorial programs vary curriculum content based on student response and student response history.

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[1]Richard C. Atkinson, "The Computer as a Tutor," Psychology Today, I, No. 8 (January, 1968), 38.

[2]Albert E. Hickey, ed., Computer-assisted Instruction: A Survey of the Literature, Technical Report, No. 8 by ENTELEK, Inc. for the Office of Naval Research, October, 1968 (Newburyport, Mass.: Office of Naval Research, 1968), 71-74.

The third and deepest level of student-computer interaction described by Suppes[1] is the dialogue system. A dialogue approach assumes responses constructed by the student which are not unique to the program. The selection and sequencing of messages between the computer and the student is thus student controlled. Atkinson describes a dialogue system as one in which:

> . . . the student is free to construct natural-language responses, to ask questionsin an unrestricted mode, and in general to exercise almost complete control over the sequence of learning events.[2]

In speaking of the dialogue system Suppes says:

> It is not enough to provide information that will give an answer; what is needed is an ability of the computer program to recognize precisely what question has been asked. This is no less than asking the computer program to understand the meaning of a sentence.[3]

While programs allowing student control of the learning process and almost free response by the pupil are being explored at several universities, the ideal of student-computer natural language interaction has not yet been achieved. Hickey[4] describes two instructional strategies which approximate Suppes' ideal of natural language student-computer interaction: socratic logic and learner controlled logic.

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[1]Suppes, pp. 219-20.

[2]Atkinson, "Computerized Instruction and the Learning Process," p. 226.

[3]Suppes, p. 219.

[4]Hickey, pp. 74-75.

Socratic logic programing allows the student to assert an answer or solution or to ask for additional data at any point in the student-computer interaction. A typical socratic logic program will present a problem to a student and a set of basic data. The student can either enter an immediate solution, request more information, or requst either the performance of certain tests or the results of the application of certain principles. Student request and computer response continue until the pupil discovers the appropriate solution and enters it into the machine.

Response limitations are placed on the pupil working with such a program. Only a limited number of pre-specified questions can be asked. In addition, the format for these questions is generally specified.

In learner-controlled logics the student makes decisions with regard to both the content and structure of the curriculum. In these programs, the student has available to him a series of maps or paths through the curriculum. As the pupil moves along any one path, he can choose to change to a more difficult or simpler path based on his own assessment of his progress. In addition, he can elect additional drill and practice or remedial work on any specific point of confusion. Again, only a pre-specified set of questions can be asked, and the format for these questions is pre-set by the program.

Two additional instructional strategies are found in the literature: simulation and gaming. In simulation programs, there is an attempt to "duplicate in the learning situation the format and

sequence of stimulus events in the real world."[1] The most well known attempts at simulation in education involve the development of Ersatz Laboratories. The Ersatz Laboratory is a substitute laboratory similar in use to the traditional laboratory, but with computer equipment. Laboratory activities are performed on the machine.

In a typical program, a real world environment is assumed by the machine. The computer itself or a program description may tell the student the basic circumstances, such as the personality profile of a patient seeking an initial psychiatric interview, the current status of the national economy, or the requirements for the construction of a building. The student then enters parameters for variables existing in the situation. The machine operates on those parameters and shows the student what the results of his actions would be in the real world.

Student-machine interaction is again pre-determined by the program. Alternative variables have been pre-selected and the format for response is given to the pupil. Students are free, however, to enter any reasonable parameter into the program.

Gaming programs are "a form of simulation involving situations of competition or conflict."[2] In a typical gaming program a competitive situation, such as the status of two companies in an industry or the condition of the international market place are described

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[1] Ibid., pp. 75-77.

[2] Ibid., pp. 77-78.

by the program or by a program guide. Competitors in the situation, such as competing industries or competing countries, are given a common set of variables on which to operate. Individuals or teams determine values to enter for their group and put these values into the machine. The program operates on the parameters from both sides and shows the results of both teams' decisions in the real world. New decisions are formulated by all teams based on simulated outcomes.

As in the more general simulation situation, student-machine interaction is again pre-determined by the program. The program fixes the variables on which teams will operate, and the response format is specified by the machine.

Implications

Inspection of the nine instructional strategies found in CAI leads to a series of assumptions which are common to all the instructional strategies developed to date. The first assumption is that learning should be individualized rather than group oriented. Gaming with group decisions is a possible exception. As Suppes emphasizes:

> The single most powerful argument for computer-assisted instruction is an old one in education. It concerns the advantages, partly demonstrated and partly conjectured, of individualized instruction . . . The computer makes the individualization of instruction easier because it can be programmed to follow each student's history of learning successes and failures and to use his past performance as a basis for selecting the new problems and new concepts to which he should be exposed.[1]

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[1]Suppes, pp. 207-08.

The second assumption is that learning should be primarily content oriented. Current instructional strategies underemphasize student affective response and the entire social dimension in learning. Little consideration has been given to how students react to the machine and how this reaction differs from reactions in a class or group learning environment.

A third assumption is that subject areas can be adapted to programing techniques. Programing assumes that a pre-planned structure can be established for the subject matter being studied. While this is true for the fundamentals of many subjects, it may not be true for certain areas and for advanced stages of other areas.

A fourth assumption which researchers are currently trying to overcome is the assumption in CAI of convergent thinking. The majority of CAI programs assume a linear relationship between the program stimulus and the subject's response. The goal of the program is to shape the student response until it matches a singular pre-determined outcome assumed within the program. Student response is to converge on the correct answer. In contrast to this method, much educational effort is aimed at divergent thinking. With divergent thinking, the goal of learning is to start with a problem and find a wide number of possible solutions.

This study introduces a new direction to computer assisted instruction. The computer is experimentally introduced into the small problem-solving group and educational outcomes are investigated. This direction makes new assumptions. Emphasis is placed

on group interaction effects on learning instead of individual results. Affect is stressed instead of subject matter content, and convergent outcomes are not pre-defined within the program.

Computer Feedback and Programed Instruction

Feedback Studies and Computer-Assisted Instruction

A thorough search of the literature shows feedback studies in CAI to be divisible into two major groups. One area of research deals with the type or kind of feedback which will maximize individual learning speed and content achievement. A second area examines timing. What schedule of reinforcement or what timing of feedback will maximize individual learning speed and promote greatest content achievement?

Types or kinds of feedback which have been examined include: knowedge of results, knowledge of correct response, response contingent feedback, verbal definition versus numerical example feedback, feedback of expert opinion, use of hints, feedback of rules, prompting, confirmation, and no feedback. Timing studies have looked at immediate feedback, delayed feedback, length of post-feedback interval, no feedback, high levels of reinforcement, low levels of reinforcement, length of post-reinforcement interval, and no reinforcement.

The assumptions of individualized instruction, content orientation, and pre-structured information behind current instructional strategies should lead to feedback studies relating to these assumptions. Emphasis in the computer feedback literature on the

type of feedback and the timing of feedback for maximum individual learning speed and content achievement support this conclusion. Research on the effects of affective feedback on group learning was not found.

Group Applications of Programed Instruction

A thorough search of the literature produced no evidence of computer research with instructional small groups. However, a set of studies relevant to this research has investigated small group use of programed-instruction material. Programed instruction (PI) is the basic method underlying the majority of computer-assisted instruction programs in use today. Though not dealing with feedback directly, these studies have feedback implicit in their design. Since programed instruction is basic to CAI, successful applications of PI to groups -- including feedback variables -- encourage a similar direction for CAI studies.

Programed instruction is defined by Lumsdaine as:

> . . . a vehicle which generates an essentially reproducible sequence of instructional events and accepts responsibility for efficiently accomplishing a specified change from a given range of initial competences or behavioral tendencies. To a specified terminal range of competencies or behavioral tendencies.[1]

Programed instruction is generally considered an individualized technique through which students can learn at their own pace and deal with material at a level commensurate with their ability. Such

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[1]A. A. Lumsdaine, "Educational Technology, Programmed Learning, and Instructional Science," Theories of Learning and Instruction, Sixty-third Yearbook of the National Society for the Study of Education, Part I (Chicago: University of Chicago Press, 1964), p. 385.

instruction was popularized in teaching machines and currently has been adapted to the computer.

Crist[1] found three problems with traditional programed instruction methods. Knowledge of results was found ineffective as a reinforcer in maintaining student attention and effort, students had difficulty applying information learned through PI, and PI provided no social dimension for learning.

Hartley[2] cited a series of studies showing other problems with individualized instruction techniques. As programed instruction was used over extended periods of time, negative attitudes developed toward the methodology, and students showed increasing boredom with the instructional process. In addition, students using individualized PI showed an inability to pace themselves properly over the material. Students proceeded either too fast, thus increasing error rates, or they tended to go through the material too slowly.

To overcome these problems, there have been a series of research efforts directed at applying programed instructional techniques to groups. Five studies, as cited by Hartley,[3] and

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[1]R. L. Crist, "Role of Peer Influence and Aspects of Group Use of Programmed Materials," AV Communication Review, XV (1967), 423-34.

[2]Hartley, "Social Factors in Programmed Instruction: A Review."

[3]Hartley, "Some Factors Affecting Student Performance in Programmed Learning," pp. 206-09.

two others[1] reported no significant difference in final content achievement between individuals using programed texts and students working in pairs with those same texts. Of the seven studies, five reported no significant differences in time needed for program completion between individuals and pairs. One study found individuals taking longer to finish the work, and one found pairs needing more time.

Hartley[2] cites six studies, and there are an additional five,[3] which compare individual programed instructional techniques with PI applied to groups of from four to thirty. Of these eleven studies, seven reported no significant differences in final content achievement between group and individual conditions. Two studies reported superior retention in groups, and two reported superior

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[1]Research studies of paired applications of programed instruction include: J[ames] Hartley and A. Cook, "Programmed Learning in Pairs: The Results of Miniature Experiments," Programmed Learning and Educational Technology, IV, No. 3 (July, 1967), 168-78; and, Grant Noble, "A Study of Differences Between Paired and Individual Learning from a Branching Program," Programmed Learning and Educational Technology, IV, No. 2 (April, 1967), 108-12.

[2]Hartley, "Some Factors Affecting Student Performance in Programmed Learning," pp. 209-11.

[3]Research studies of group applications of programed instruction include: Crist, "Role of Peer Influence and Aspects of Group Use of Programed Materials," pp. 423-34; Robert Crist, "Group Use of Programmed Instruction as a Means of Generating Homogeneous Study Groups," AV Communication Review, XVII, No. 2 (Summer, 1969), 201-09; C. H. Frye, "Group Versus Individual Pacing in Programmed Instruction," AV Communication Review, XI (July, 1963), 124-30; G. C. Kress, "Study of the Effects of Administering Programmed Instruction to Interacting Groups," Journal of Educational Psychology, LX (August, 1969), 333-38; and, D. L. Moore, "Group Teaching by Programmed Instruction," Programmed Learning and Educational Technology, IV, No. 1 (February, 1967), 37-46.

retention by individuals. In all eleven studies, the groups took longer to complete the work than individuals.

Even though groups took longer to complete the task, grouping had beneficial results. Grouping added a social dimension to learning and in so doing tended to increase student motivation, attention, and interest in the subject matter when compared with individualized PI.

Carpenter,[1] in reporting a series of studies dealing with programed instruction under conditions of individual pacing and group interaction at the college level, reported no unfavorable results with the group approach. Carpenter concluded that programed material can be pre-paced and presented to students in groups without significantly reducing the learning which occurs in self-paced and individual study. Carpenter further found that the medium through which the programed material was presented had no differential effect on learning outcomes between individual and group paced instruction. Students learned equally well individually and in groups when using programmed texts, teaching machines, or television.

These results point to the conclusion that while group learning with PI material takes longer than individual pacing, group methods offer certain advantages. Increased motivation, attention, and interest, and high retention levels are encouraging to the group approach. These encouraging results developed in spite of the fact that research studies used programs written for individuals instead

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[1]C. R. Carpenter and L. P. Greenhill, eds., Comparative Research on Method and Media for Presenting Programmed Courses in Mathematics and English Grammar (University Park: Pennsylvania State University, 1963).

of for group administration. Students in researched groups were a combined set of people learning primarily individually rather than a true interacting group. Interaction between members was present but was not a major component of the program.

Two areas have been explored in an attempt to reduce the increased completion time needed by groups without reducing learning achievement. One area is pacing. Hartley[1] reports several studies of group external pacing methods by which groups proceed at a rate determined by an external criterion instead of at the rate of the slowest subject (individual pacing). Hartley concludes that " . . . external pacing, provided care is taken to ascertain the optimal pacing rate, does not affect learning achievement . . . It appears that as much as twenty per cent reduction in time may be successfully achieved in some cases by external rather than individual pacing . . . "[2] Hartley mentions that changes in student attitudes as a result of external pacing have not been thoroughly studied.

Grouping has also been used in an attempt to reduce completion time in group PI. Students have been grouped (primarily paired) in a variety of ways. Methods include: grouping by similar ability or preknowledge, grouping by dissimilar ability or preknowledge, and grouping randomly. None of these combinations has

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[1]Hartley, "Some Factors Affecting Student Performance in Programmed Learning," pp. 211-16.

[2]Hartley, "Social Factors in Programmed Instruction: A Review," p. 11.

consistently produced either successful achievement grouping or improvement in group learning time. In recent research, Crist[1] has developed a new method of achievement grouping which successfully combines subjects on ability but still shows increased completion time for groups when compared with individuals.

Successful results with group applications of PI have produced programs written especially for small groups. Group programs use PI methodology and stress group interaction as intrinsic to the program itself.[2] Complimentary to such programs have been the construction of group facilities to apply group programed-instruction materials. Holling[3] has developed the Feedback Classroom, Moore[4] the Group Teaching Machine, and Twelker[5] the Automatic Classroom. Such improved programs and facilities will hopefully reduce the increased learning time needed by groups when using PI.

Summary

Feedback studies in computer-assisted instruction do not seem to have dealt with the effects of affective feedback on group

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[1]Crist, "Group Use of Programmed Instruction as a Means of Generating Homogeneous Study Groups," pp. 201-09.

[2]Hartley, "Social Factors in Programmed Instruction: A Review," p. 11.

[3]K. Holling, "The Feedback Classroom," Programmed Learning, I, No. 1 (May, 1964), 17-20.

[4]D. L. Moore, "Group Teaching by Programmed Instruction," pp. 37-46.

[5]Paul A. Twelker, "The Teaching Research Automated Classroom (TRAC): A Facility for Innovative Change," Programmed Learning and Educational Technology, IV (1967), 316-23.

learning. The goals of computer-assisted feedback research have been to maximize individual learning speed and content achievement. Two types of studies have been conducted in reaching these goals. One type has been concerned with the kind of feedback that will maximize learning speed and achievement. A second type has explored timing. Studies have looked at the schedule of feedback that will bring maximum learning speed and achievement.

The methodology underlying the majority of computer-assisted instruction programs is programed instruction. While computer-assisted instruction has apparently not been used with groups, programed instruction methods, including implicit feedback variables, have seen several successful group applications. Profitable application of PI to groups should lead to similar studies with CAI.

In these applications, individual programed-instruction materials have been applied to groups. Achievement with group applications is equivalent to achievement with individual use. However, groups using PI take longer to complete the material than do individuals. There are advantages to group use of programed instruction in that group members show increased levels of motivation, attention, and interest when compared with individual PI.

Research on group applications of PI has almost exclusively given individualized programs to groups. In such a setting, a combination of people is learning primarily as individuals, and learning effects of a true interacting group are largely absent. Programs are now being written for interacting groups, and facilities are being built which stress group learning with

programed-instruction materials. While research has not, as yet, significantly improved group learning time, it is hoped that improved facilities and improved programs may help in this direction.

Implications

The small group literature clearly indicates that interaction within the small learning group affects both affective and subject matter content outcomes as traditionally conceived in education. However, a survey of the literature has uncovered no studies in which computer-assisted instruction has been attempted with small groups. CAI has emphasized individualization of instruction and content orientation in which pupils individually converge toward pre-determined correct answers. Programing has stressed subject areas adaptable to this approach.

While CAI has not been attempted with small groups, programed instruction, the basic methodology underlying CAI has been applied successfully in several group learning experiments. If programmed instruction has been beneficially used in group learning, it follows that programmed instruction as part of computer-assisted instruction would be a logical direction for group study.

This research applies CAI to small group instruction and tests for beneficial educational outcomes. Specifically, the computer is used to supply inter-member affective feedback within the small problem-solving group. Hypotheses question whether such feedback will improve affective relationships within the group and improve the group handling of subject matter content.

This represents a new direction for computer-assisted instruction. Emphasis is placed on group rather than individualized instruction, there is an affective rather than a content orientation, and a pre-determined convergence toward correct solutions is not embedded within the computer program itself.

In this study, group functioning is conceptualized through a work-emotionality framework. In analyzing the feedback loop, a model of small group communication applies the group work-emotionality framework to measurable educational outcomes.

The model stresses a three channel analysis of communication in which affective and information aspects of communication are segregated. In the experiment, affective data is translated into the information channel of communication as feedback. Hypotheses analyse the effects of this affective feedback on affective relationships within the group and on the group's handling of subject matter.

Research studies in the small group literature indicate several outcomes which should emerge. It is expected that affective feedback given to small problem-solving groups should result in at least four subject matter or information channel outcomes: improved group productivity; improved problem-solving efficiency; increased cooperation among group members; and, increased interest in task by group members. Additionally, there should be at least two affective or delivery channel outcomes: increased openness as to feelings by group members and increased cohesiveness with the group. Other research hypotheses have not been explored in the research literature.

CHAPTER III

THE DESIGN AND PROCEDURES OF THE STUDY

Hypotheses

In analyses of computer-assisted instruction, one element which is an essential part of the system has remained, in a sense, external to it. This element is the student. The student is subject to a variety of environmental conditions, individual attitudes, and social pressures that are not accounted for in the hardware, the software, or the instructional strategies of the system. A review of the literature shows that social factors influence instructional processes and learning outcomes. The affective and other internal and external factors that influence the student in CAI add to, or detract from, the effectiveness of any CAI system. The individualized and content oriented nature of current CAI has not dealt with the full range of influences, both internal and external, that affect the student. If a wider range of these elements can be experimented on, analyzed, and fully taken into account, then more effective teaching and learning should result.

Affective reactions are a major factor influencing learning outcomes. This research begins consideration of affective influences by launching a new direction for computer-assisted instruction. The computer is introduced into the social relations of ongoing groups.

Analysis is made to determine if the computer, by supplying inter-member affective feedback within small adult learning groups, can enhance group instructional processes and learning outcomes.

During experimentation, natural small experimental groups of college students worked on problem-solving case studies in a laboratory setting. Group member affective reactions during problem-solving sessions were defined as incongruency in the delivery style channel of communication between each subject's culture preference work-emotionality behaviors and the affective approach work-emotionality behaviors of others. Subjects quantified their incongruency on a three dimensional ordinal scale. Each subject then received the quantified reactions of all other subjects to his work-emotionality behaviors. Quantified reactions became feedback data in the information channel of communication. Groups discussed the feedback with emphasis on improving group problem solving. A second problem-solving session followed.

The hypotheses to be investigated are:

I . . . Group member affective reactions to work-emotionality behaviors in the delivery channel of communication, quantified and given to all other group members as feedback data in the information channel of communication, will result in increased congruency between each group member's affective approach work-emotionality behaviors and the culture preference work-emotionality behaviors of other group members during future group problem solving as measured by:

A . . . a greater increase in perceived satisfaction with expressed work-emotionality behaviors among experimental group members than among control group members

Perceived satisfaction is measured by a group member seven-point ordinal rating scale. An increase is measured by a positive change in group member self-report scale scores.

B . . . a greater change in work-emotionality behavior activity perceived by experimental group members in directions indicated by group member feedback reports than by control group members

Amount of perceived activity is measured by a group member self-report six-point ordinal rating scale. Desired directions for activity are indicated by a group member self-report three-point ordinal scale.

Group member affective reactions to work-emotionality behaviors in the delivery channel of communication, quantified and given to all other group members as feedback data in the information channel of communication, will result in analysis of problem-solving subject matter in the information channel of communication during future group problem solving which is characterized by:

II . . . greater improvement in decision-making procedures leading to a group product perceived by the experimental group than by a control group

Decision-making procedures are defined and measured by the Decision-Making Procedures Check List. Improvement in perceived decision making is measured by a positive change in group member scores on the self-report nine-point ordinal scale.

III . . . greater improvement in <u>creativity</u>[1] of group product by the experimental group than by a control group

<u>Creativity</u> is defined and measured by calculation of a group Creativity Index. Improvement in <u>creativity</u> is defined by a positive change in the group Index.

IV . . . greater improvement in <u>accuracy</u> of group product by the experimental group than by a control group

<u>Accuracy</u> is defined and measured by calculation of a group Productivity Index. Improvement in <u>accuracy</u> is defined by a positive change in the group Index.

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[1]Technical terms are underlined when first defined and at other points where definitions are crucial for full technical understanding.

V . . . greater improvement in the utilization of group resources for problem solution by the experimental group than by a control group

Utilization of group resources is defined and measured by calculation of a group Utilization of Resources Index. Improvement in utilization of group resources is defined by a positive change in the group Index.

VI . . . a greater increase in the number of perceived solutions to problems by experimental group members than by control group members

Number of perceived solutions is measured by a five-point ordinal scale on the Shaw Task Dimension Scale. An increase is measured by a positive change in group member scores on the self-report scale.

VII . . . a greater decrease in perceived difficulty with the subject matter of problem solving by experimental group members than by control group members

Perceived difficulty is measured by a five-point ordinal scale on the Shaw Task Dimension Scale. A decrease is measured by a negative change in group member scale scores on the self-report scale.

VIII . . . a greater increase in perceived cooperation in problem-solving among experimental group members than among control group members

Perceived cooperation is measured by a five-point ordinal scale on the Shaw Task Dimension Scale. An increase is measured by a positive change in group member scale scores on the self-report scale.

Group member affective reactions to work-emotionality behaviors in the delivery channel of communication, quantified and given to all other group members as feedback data in the information channel of communication, will result in delivery channel activity during future group problem solving which is characterized by:

IX . . . a greater increase in interest in the subject matter of problem solving perceived by experimental group members than by control group members

Perceived interest is measured by a five-point ordinal scale on the Shaw Task Dimension Scale. An increase is measured by a positive change in group member scale scores on the self-report scale.

X . . . a shift in the experimental group toward a pairing basic assumption culture not found in a control group

Basic assumption culture is measured by analysis of audio tape recordings of problem-solving sessions by two trained judges. A shift toward pairing is movement from fight-flight, through dependency, and into a pairing culture.

XI . . . a greater increase in feelings of cohesiveness perceived among experimental group members than among control group members.

Perceived cohesiveness is defined and measured by the questions on the Member Questionnaire. An increase is measured by a positive change in group member total scores on the self-report instrument.

XII . . . a greater increase in the open expression of feelings toward the problem-solving task perceived among experimental group members than among control group members.

Perceived open expression of feelings is defined and measured by the Leveling Scale. An increase is measured by a positive change in group member scores on the self-report nine-point ordinal scale.

XIII. . . . Group member affective reactions to work-emotionality behaviors in the delivery channel of communication, quantified and given to all other group members as feedback data in the information channel of communication, will result in: a greater positive change in the dimensions of meaning of small group experience for experimental group members than for control group members

Meaning of small group experience is measured by group member factor scores from a self-report Semantic Differential instrument used to evaluate the subject "my small group experience". Positive change is measured by an increase in factor scores for group members.

Definition of Terms

The theoretical terms are specified in Chapter II. This section contains definitions of only those terms central to the experimental aspects of the investigation. The four-man problem-solving

groups used in the study were considered in accordance with Bales' definition:

> . . . a group is any number of persons engaged in interaction with one another in a single face-to-face meeting or series of meetings, in which each member receives some impression or perception of each of the members distinct enough so that he can give some reaction to each of the others as an individual person (even if it was only to recall that the other person was present).[1]

Feedback supplied to these groups refers to information given to small instructional group members concerning individual and group cognitive and affective behavior. This study deals only with affective feedback.

To understand the concept affective feedback, it is necessary to initially understand the term valency. Valency is an individual personality characteristic which explains the group relevant aspects of personality. Valency is defined as the pattern of internal predispositions to act in groups which form a coherent system within personality and determine how a person will respond and contribute in small group interaction.

Valency can be "differentiated into three related but distinguishable elements: area of concern, culture preference, and affective approach."[2] By area of concern is meant "an affect laden problem, that, on some internal, possibly unconscious level is felt to be significant by the individual and mobilizes his psychic

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[1]Bales, p. 33.

[2]Stock and Thelen, p. 23.

energies."[1] Boyd adds to this definition by analyzing the area of concern in Eriksonian ego stage development. Culture preference refers to the group behavior patterns which are preferred by the individual. Individuals have definite preferences for behaviors they want to see in groups. Affective approach describes the way the individual responds expressively to various group behavior patterns; that is, how he behaves and how he does not behave.

The culture preference portion of individual valency was measured prior to experimentation. The measure of culture preference was the benchmark against which later group activity was evaluated. During experimental sessions, small group subjects observed or did not observe their culture preference behaviors in the behavior of others. All group members during experimental sessions were reacting in accordance with the affective approach portion of valency within their personalities. Expressive behavior primarily reflects the individual's affective approach area of valency. Affect was then defined as the incongruency between each subject's culture preference behaviors and the observed affective approach behaviors of each of the other subjects in the group. Individuals quantified incongruency for every other group member on three integrated ordinal rating scales.

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[1] Ibid.

Subjects and Experimental Groups

Ad hoc groups show significantly different patterns of interaction,[1] creativity, and productivity,[2] than do ongoing groups. Therefore, to evaluate the effects of computer-assisted affective feedback on group functioning, it was felt that ongoing natural groups with a history and phase development pattern should be examined.

To explore ongoing groups, experimentation was integrated into a course in adult instruction in the School of Education at the University of Wisconsin. The ninety-six students in the class were junior and senior females (with one exception) in the School of Nursing at the University.

All ninety-six students were used as subjects in the experiment. Since the population of nurses is specialized and not random, caution must be taken in generalizing results to different populations. Within the experiment, however, randomizing procedures were strictly observed in forming and directing groups.

Working closely with the course instructor, regular small group meetings for all students were made a part of the course instructional plan. On the first day of class, the ninety-six students were assigned randomly into twelve groups of eight. Course instruction involved two class lectures and one small group meeting each week.

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[1]Paul A. Hare, Handbook of Small Group Research (New York: Free Press of Glencoe, 1962), p. 70.

[2]Jay Hall and Martha S. Williams, "Comparison of Decision Making Performances in Established and Ad Hoc Groups," Journal of Personality and Social Psychology, III, No. 2 (1966), 214-22.

During all small group meetings, both prior to and after experimental sessions, groups received assignments dealing with course subject matter. In working on the assignments, groups interacted for about an hour and completed a series of group interaction instruments. These same instruments were used during experimentation and provided a benchmark for analyzing experimental intervention and post-experimental effects.

The consent of all group members for experimentation was obtained, and all twelve groups were scheduled for one three-hour research session. Sessions took place at the Laboratory of Adult Learning and Instruction at the University of Wisconsin.

Within each of the twleve groups of eight, subjects were randomly divided into paired groups of four for their research session. Groups of four were paired in the sense that they shared a common history and phase development over the full semester. The groups of four allowed sufficient interaction and differentiation among individuals for successful experimentation. Hare sites five as a good size for small group research.[1] For purposes of longitudinal analysis, no differences in group processes were assumed between sub-groupings of four and composite groups of eight.

To handle paired groups of four, four computer typewriters were installed in the Adult Instruction Laboratory. Typewriters were connected through telephone lines to the Burroughs 5500 computer at the University of Wisconsin Computing Center.

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[1]Hare, p. 225.

The Experimental Design

Prior to experimental manipulation, groups of eight were administered a series of pre-tests. During the research sessions groups of eight were divided randomly into a four-man experimental and a four-man control group. Paired groups of four were matched in that each set had a similar history and phase development.

The matched sets were divided into two arrangements. In one arrangement one group of a matched set received computer-assisted feedback while the other group received no feedback. In the other arrangement one group received hand-calculated feedback and the other group received no feedback. Thus two types of experimental groups and two types of control groups were used in the study. One experimental group received affective feedback from computer typewriters. A second experimental group received identical written feedback compiled by an experimenter. One control group entered affective reactions into computer typewriters but received no feedback. A second control group wrote affective reactions on typed sheets by hand but received no feedback. Comparisons between machine-administered feedback, hand-tabulated feedback, and the two control conditions were made for ten hypotheses. Three hypotheses compared feedback and no feedback conditions.

There were no additional control groups in the study. There were, therefore, no "no treatment" conditions. All subjects received some form of pre-test, post-test and experimental treatment. Inferences were drawn with this limitation in mind.

The structure of the experimental design required statistical inference from eight-man pre-experimental groups to four-man experimental results. The use of natural groups did not allow pre-experimental segregation of eight-man groups into four-man sections. It is realized that this pattern of inference leads to serious theoretical and methodological problems. The dynamics of groups of eight differ from the dynamics of groups of four. Therefore, group level responses for groups of eight can be used to predict individual responses in groups of four with only limited validity. In addition, the parceling out of scores from eight-man groups in analyzing four-man results is another weakness of the study. While these problems weaken experimental intervention conclusions, research session and post-experimental conclusions remain without qualification.

Figures 1, 2, and 3 outline the details of the experiment. Figure 1 shows the experimental design coordinating pre-test, experimental intervention, and post-test periods. Figure 2 shows the pre- and post-test periods, tests administered during these periods, and what was measured by each test. Figure 3 shows the experimental intervention, tests administered during experimentation, and what each test measured.

Computer
Interaction

Group	Pre-test	Experimental Intervention				Post-test
		Observe	Test	Observe	Test	
Experimental Feedback	N=8	N=4	Computer Interaction Feedback	N=4	N=4	N=8
Control No Feedback		N=4	Computer Interaction No Feedback	N=4	N=4	

Experimenter
Interaction

Group	Pre-test	Experimental Intervention				Post-test
		Observe	Test	Observe	Test	
Experimental Feedback	N=8	N=4	Written Interaction Feedback	N=4	N=4	N=8
Control No Feedback		N=4	Written Interaction No Feedback	N=4	N=4	

Fig. 1.--Experimental design

Weekly Group Meeting	Test	Administered To	Measure
One through Seven	I: Shaw Task Dimension Scale	Groups of Eight	I: A. Difficulty with task B. Cooperation on task C. Interest in task D. Number of problems
	II: Decision Making Procedures Check List	Individuals	II: Group Decision Making Procedures
	III: Leveling Scale	Individuals	III: Individual's Open Expression of Feelings
Eight	I	I	I
	II	II	II
	III	III	III
	IV: Ideal Group Q Sort	Individuals	IV: Culture Preference Work-Emotionality Behaviors
Nine	I	I	I
	II	II	II
	III	III	III
Ten or Eleven	Experimental Intervention	Groups of Four	See Table
Twelve through Fourteen	I	I	I
	II	II	II
	III	III	III
Fifteen	I	I	I
	II	II	II
	III	III	III
	V: Semantic Differential	Individuals	V: Meaning of Small Group Experiences

Fig. 2.--Pre-test and post-test periods

Phase	Test	Administered To	Measure
One	Semantic Differential	Individuals	Meaning of Small Group Experience
Two	None	-	-
Three	Case Study	Individuals and Groups of Four	A. Group Creativity B. Group Productivity C. Group Utilization of Resources D. Group Conflict
Four	Member Questionnaire	Individuals	Cohesiveness
	Shaw Task Dimension Scale	Individuals	A. Difficulty with task B. Cooperation on task C. Interest in task D. Number of problem solutions
	Decision Making Procedures Check List	Individuals	Group Decision Making Procedures
	Leveling Scale	Individuals	Individual Open Expression of Feelings
Five	Rating of Behavior	Individuals	Inter-member Affective Reactions
Six	Repeat of Phase 2	Phase 2	Phase 2
Seven	Repeat of Phase 3	Phase 3	Phase 3
Eight	Repeat of Phase 4	Phase 4	Phase 4
Nine	Repeat of Phase 5	Phase 5	Phase 5
Ten	Repeat of Phase 1	Phase 1	Phase 1

Fig. 3.--Experimental intervention

The Sessions and the Research Situation

The Pre-Test Period

Randomly assigned groups of eight subjects met weekly during the full semester and solved small group problems dealing with the course subject matter. Experimental intervention took place during the tenth and eleventh weeks of class. Three small group instruments were filled out during all weekly group meetings -- two individually and one by the group as a whole. These same three instruments were later administered during the research sessions. While students were often aware of other students' responses, specific feedback was never supplied on these instruments during either small group meetings or experimental intervention.

After eight group meetings, subjects were given the Ideal Group Q Sort to sort at home. Students were instructed to rank small group behavior statements from those they would most like to see in their small instructional groups to those they would least like to see. Results of these sorts became the basis for affective ratings during experimentation.

Experimental Intervention

All twelve groups were scheduled for one evening three hour experimental session in the Adult Instruction Laboratory during the tenth and eleventh week of classes. All sessions were conducted by

reading from a written script, thus providing a common experience for all subjects. A copy of the script is in Appendix A. Sessions were also audio tape recorded for later study.

Research sessions consisted of a series of related activities. Chronologically the sessions could be conceptualized as occurring in ten distinct phases.

Phase I

All eight subjects met in a common room around a circular table. The nature of the evening's activities was read, and the first semantic differential was administered. The differential measured the subject "my small group meetings" and evaluated each subject's feelings about his small group prior to experimentation.

Groups of eight were then randomly divided into two groups of four -- a four-man experimental and a four-man control group. The experimental group was taken to the Adult Instruction Laboratory on the first floor. The control group moved to a similar meeting room on the third floor. A diagram of the Instruction Laboratory appears in Figure 4. Facilities included a circular discussion table, chairs, a ceiling recording microphone, a one way window, an observation room, and a tape deck. The third floor room contained a circular table, chairs, and a recording microphone.

Phase II

Since only one set of four computer typewriters was available, it was necessary to stagger each group's use of the computing facilities. Therefore, the control group initially listened to a

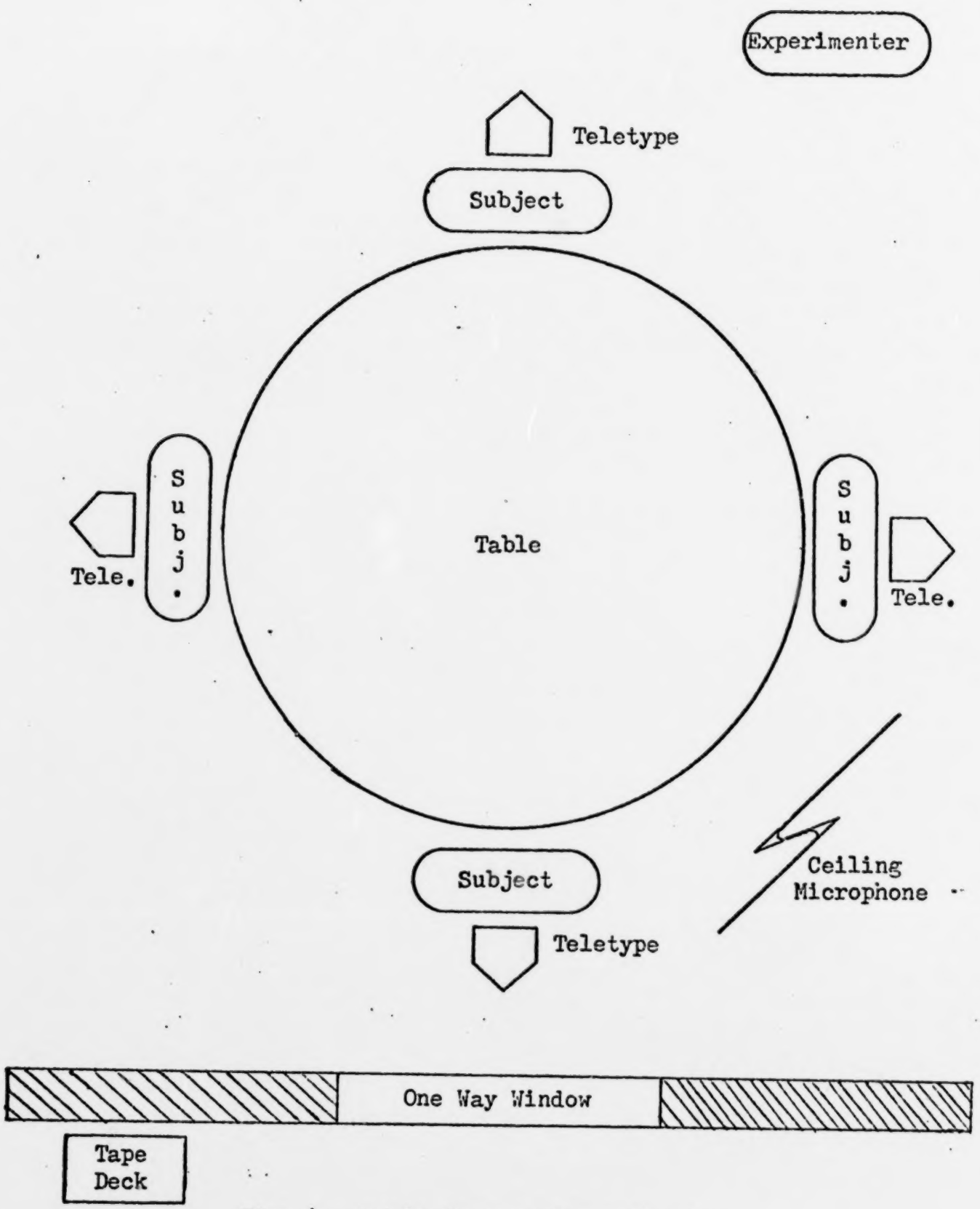

Fig. 4.--Adult Instruction Laboratory

ten minute tape recording which did not deal with the experimental subject matter. The tape was an Earl Nightengale recording entitled "How You Can Lead the Field in the Modern World" which gave general human relations advice on success in any profession. The ten minute delay allowed experimental and control groups to gain equal exposure to the computer facilities. The experimental group received no ten minute delay period and went directly to Phase III.

Phase III

The first case study was given to both experimental and control groups. The study was an incomplete problem involving nursing and education. Eight answers were provided to the study, and subjects were to rank answers from the one they considered most desirable and to be done first, to the one they considered least desirable and to be done last. Subjects ranked the solutions individually and then worked as a group toward a single group ranking. Thirty minutes were allowed for Phase III.

Phase IV

Four instruments analyzing group interaction in the previous phase were administered to both experimental and control groups. All subjects filled out the Member Questionnaire measuring individual feelings of cohesiveness. They then analyzed as a group the number of tasks involved in solving the case study problem and named each task. On an answer sheet listing task names, individuals completed the Decision-Making Procedures Check List and the Leveling

Scale. Each member determined the primary decision-making procedure he felt was used in working on each task. Each task also received a Leveling score depicting how openly each subject had expressed his feelings during interaction. Next, subjects filled out the Shaw Task Dimension Scale. Each task was listed on an answer sheet and rated on the six dimensions of group tasks expressed on the Shaw scale. Each task received six ratings analyzing subjects' reactions to the task.

Phase V

Each group member was handed a three-dimensional rating scale, and a training session followed on its use. Members were instructed on what each dimension meant, what they were to do with the scale, and they were given examples of how the scale was to be applied. As a test of their understanding, hypothetical problems were presented to the group and each member was asked for an answer. Questions were answered on the scale, students agreed they knew how to apply the scale, and they proceeded to rate each other on the preceding case session.

In computer groups, experimental subjects turned to the computer connected typewriters and entered their name. The computer typewriter printed, one at a time for each subject, the two behaviors he most wanted to see in his instructional group as measured by his Q sort results. After printing the first behavior, the typewriter listed one of the other group members and asked for a rating on him for the listed behavior. Members entered three numbers off each of

the three scales, and the computer then moved to a second person in the group. After ratings had been entered for all subjects, the second behavior was printed and ratings were again solicited by the machine. A sample rating sequence is shown in Figure 5. When all subjects had completed their ratings, the computer tabulated scores and printed results to all subjects. Results for each person involved a listing of everyone's two ideal group behaviors and the responses on the three scales that he received. Thus each person knew the behaviors of all other members and how he had been rated on those behaviors. Subjects removed print out results from the machine and used them for reference during Phase VI. A sample print out of rating results is shown in Figure 6.

The four control members in computer groups received their ideal behaviors through the typewriters. They entered ratings of all other group members on these behaviors in the same manner as experimental members. However, they received no feedback results.

In hand-tabulated feedback groups, experimental members received their ideal behaviors typed on sheets of paper. Under those behaviors they rated each of the other group members next to individual names. An experimenter collected all rating results and retabulated the figures. Each member received sheets listing the ideal behaviors of each other member, and how he had been rated on those behaviors. Results became the subject matter of the feedback discussion session.

Control members in hand-tabulated groups received their ideal behaviors on sheets of paper. They rated other members next to their

Please type name
: June Young

I think a group should be ready to argue about the implications of decisions it makes.

Lorie Gunderson
: 122

Michell Matthews
: 365

Mary Meyers
: 143

I think a group should attempt to keep all members satisfied and willing to accept the dominant mood of the group.

Lorie Gunderson
: 355

Michelle Matthews
: 273

Mary Meyers
: 132

Please wait for others to finish.

Fig. 5.--Rating by one group member of other members in the group. (All names are fictitious.)

Lorie Gunderson
I think members should remind the group of the need for unity and warmth.
54
Stay the same

I think group members should disclose attitudes to the total group, not to selected individuals.
65
Stay the same

Michelle Matthews
I think a group should fight for many varied answers to its learning problems.
44
Stay the same

I think a group should tend to follow the insightful suggestions of its most creative members.
43
Do more

Mary Meyers
I think a group should be very businesslike in defining its work requirements.
72
Do less

I think group members should conceal true feelings that might hinder deep concentration on accomplishing its goals.
53
Do less

Fig. 6.--Feedback given to one group member from other members of the group. (All names are fictitious.)

names printed under each behavior. An experimenter collected the rating results but did not supply subjects with feedback data.

Phase VI

Feedback discussion sessions were held for all experimental groups -- both hand-tabulated feedback groups and computer-tabulated feedback groups. Groups were given ten minutes to discuss the rating results that each member received. Their instructions were to discuss the feedback data with a view toward improving their group functioning on a second case study.

No-feedback control groups -- both computer-interaction and hand-tabulated groups -- had no discussion sessions. They went directly to Phase VII.

Phase VII

A second case study, identical in form to the first study, was analyzed by all experimental and control groups. Again, results were tabulated first individually and then a group solution was determined through interaction. Case studies were alternated to eliminate case effects. Half of the twleve groups received Case I first, and half initially received Case II. Studies were also alternated between the twelve experimental and control groups. Half the time experimental groups and half the time control groups received Case I first. Thirty minutes were again allowed for completion of the task.

Phase VIII

All subjects were again administered the Member Questionnaire. They then determined the tasks involved in solving the second case study. After group agreement on tasks, members individually completed the Decision-Making Procedures Check List, the Leveling Scale, and the Shaw Task Dimension Scale. Responses were based solely on the second group session.

Phase IX

Each member again received his two ideal group behaviors and repeated ratings on every other group member for the second interaction session. For computer interaction groups -- both experimental and control -- ratings were entered into the computer typewriters. For hand-tabulated groups -- both experimental and control -- ratings were entered on typed sheets. No group received feedback on this second rating. Computer ratings were stored within the machine and hand-written ratings were collected by an experimenter.

All ratings were available for later analysis. Hand-written ratings were on the sheets retained by the experimenter. Computer ratings were stored in the machine and made available as print out the next day.

Phase X

The last test for the evening administered to all subjects, was the Semantic Differential. The subject rated was "tonight's small group meeting." Comparisons between the initial differential and the final differential were available for all groups. Exploration

could be made as to how hand-tabulated and computer-assisted feedback groups, and their two corresponding control groups reacted to the experimental sessions.

The Post-Test Period

All subjects continued to meet in their groups of eight until the end of the semester. They worked on small group problem-solving tasks and filled out instruments used during the experimental sessions as part of their weekly meetings. Instruments filled out by groups prior to experimental sessions, during research itself, and after the experimental sessions, were the Decision-Making Procedures Check List, the Shaw Task Dimension Scale, and the Leveling Scale. Long term comparative analyses were possible on these instruments.

During the last class meeting of the semester all subjects completed one more semantic differential. The subject used was "my small group meetings", thus providing data on the lasting effects of experimental sessions when compared with previous differentials.

Data-Gathering Devices and Techniques

Ideal Group Q Sort

Perceived Group Q Sort

Instrumentation and Data Collection

During the eighth week of classes all ninety-six subjects sorted the Ideal Group Q Sort. The sort has seventy-two cards containing statements of small group work-emotionality behaviors. Statements are based on the twenty-four work-emotionality categories

which emerge from combination of four work levels with six emotionalities. Statements on the seventy-two cards represent three replications of the twenty-four behavior types pictured in Figure 7. The Ideal Group Q Sort statements are in Appendix B.

Emotionality

		Fi	Fl	P	Cp	D	Cd
	I						
Work	II						
Level	III						
	IV						

Fig. 7.--Work-emotionality categories

Subjects were told to sort the statements into eleven piles. Pile one was to have two cards, pile two, three, and so on until a normal distribution was described by the eleven piles. Pile one contained the two statements a student would most like to see in his small, eight-man instructional group, and pile eleven contained the statements the student would least like to see. This histogram represented a forced normal distribution ranking of behaviors from those students would like to see most, to those they would like to see least, in their small problem-solving groups. It was possible that no one statement was completely congruent with each individual's intended description of desirable group behavior. However, accumulations of statements over three replications of specific work-

emotionality combinations were thought to be sufficiently precise to measure work-emotionality preferences.

The Ideal Group Q Sort measured the culture preference portion of the valency pattern within each person's personality. The two behaviors that each subject wanted to see most in his small instructional group were extracted from each subject's sort and matched with the two identical items in the Perceived Group Q Sort. The Perceived Group Q Sort contained seventy-two behavior statements which were similar, item by item in work-emotionality content, to the statements in the Ideal Group Q Sort. Sort differences were in the wording rather than the content of each item. The Perceived Group Q Sort describes the actual functioning of a group rather than describing how the subject would like the ideal group to be. Copies of the statements in the Perceived Group Q Sort are found in Appendix B along with the Ideal Group Q Sort statements. The two most liked behaviors for each member as described in the Perceived Group Q Sort were stored in the B5500 Computer prior to experimental sessions.

Reliability and Validity

The original conception for this type of Q Sort cam from William Hill, whose work is incorporated into the studies of Stock and Thelen.[1] The specific sorts used were developed by Boyd and Watson.[2] Their final products were extensions and modifications of Hill's original work.

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[1]Stock and Thelen, pp. 102-13.

[2]Watson, "The Dynamics of Expectations and Adaptations to Adult Learning Group Cultures," pp. 48-57.

Nunnally[1] and Stephenson[2] have established procedures for determining the reliability, validity, and statistical analysis of Q sorts. Content validity was investigated for the seventy-two items which make up the subject matter of the two sorts. Items were revised and rewritten until two naive judges reached one-hundred percent agreement on the work level and emotionality type of the seventy-two behaviors.

Analysis of variance was used to determine if the 72 items in each sort discriminated among the 24 work-emotionality categories and, between the two sorts. The goal was to establish face validity or meaningfulness of the two instruments.[3] A group of fifteen naive female subjects threw the Ideal and Perceived Q Sorts into a seven pile normal distribution. Subjects' scores were partitioned against work-emotionality categories to produce a 15 by 24 matrix. A significant F ratio would indicate that for the sample the items used discriminated between work-emotionality categories. The Ideal sorts were found to have an "F" of 7.29, significant at the .01 level, with 14 and 336 degrees of freedom respectively. An "F" of 11.48 was found for the Perceptive sorts, also significant at the .01 level with the same degrees of freedom. These results indicated that there were significant differences in the distributions of the cards between categories, within each sort, and between sorts.

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[1]Jum C. Nunnally, Psychometric Theory (New York: McGraw-Hill, Inc., 1967), pp. 544-57.

[2]William Stephenson, The Study of Behavior (Chicago, University of Chicago Press, 1953).

[3]Ibid., p. 55.

Reliability of the sorts was measured through use of the "t" test to determine if the mean of the scores in any one of the 24 work-emotionality categories for all fifteen subjects was significantly different from the mean of any other category. The same procedure was followed for the Ideal and the Perceived sorts. There were no significant differences between the means of any categories in either sort at the .05 level of significance. This suggests that none of the categories in either sort had a significantly "good" or "bad" connotation for the experimental group.

Another reliability measure was a stability coefficient calculated to determine if the Ideal Sort gave consistent measurement over time. Since the basic elements in both sorts are identical, and complete stability of interaction in experimental groups is not possible, it was assumed that stability of the Ideal Sort would indicate similar stability in the Perceived instrument. A naive subject sorted the Ideal deck into seven piles three times at intervals of one, two and three days. Fisher's r to z transformation was used to obtain the average of the intercorrelations of the trials.[1] The result was an r of .82 significant beyond the .01 level of significance. It is concluded from these results that the Ideal and Perceived Q Sorts are stable and meaningful instruments. They do not seem to constitute a learning experience which would alter perceptions or ideals for work-emotionality behaviors.

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[1]J. P. Guildford, Fundamental Statistics in Psychology and Education (New York: John Wiley and Sons, Inc., 1962), p. 139.

To determine if subjects could use Q Sorts to indicate the degree of similarity or dissimilarity of perceived group behaviors to their ideal expectations, rank order correlation coefficients[1] of each set of Ideal and Perceived sorts were calculated for a sample of fifteen naive female subjects who were meeting weekly in a seminar program at the University. The coefficients of correlation for the fifteen sets ranged from .55, significant at the .01 level, to -.40 significant at about the .05 level. Three other correlations (.38, .35, .32) were significant between the .10 and .05 levels. A two-tailed test of significance was used. These results suggest that Q Sorts can be used by group members to discriminate between their expectations for group culture and their perceptions of the culture experienced.

Scoring and Statistical Analysis

A standard scoring procedure has been established for the Q Sort.[2] Q Sort scores and statistical analysis of results were not a part of this research.

The two "most liked" statements in the Ideal Group Q-Sort were matched with similar statements in the Perceived Group Q Sort and stored in the computer prior to research sessions. During experimentation, these desired behaviors became the statements used by each individual to evaluate the affective approach actions of other members.

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[1]Watson, "The Dynamics of Expectations and Adaptation to Adult Learning Group Cultures," p. 133.

[2]Ibid., p. 72-73.

Ratings of Audio Tape Recordings

Instrumentation and Data Collection

All twenty-four sessions of group problem solving for experimental and control groups were tape recorded, as were the twelve experimental group discussion sessions of affective feedback. The four-man thirty-minute and ten-minute sessions were rated to determine basic assumption culture. Two trained raters scored all of the problem solving and feedback sessions by listening to the tape recordings and scoring the basic assumption culture of the group at regular intervals. Culture was evaluated at three-minute intervals for the problem sessions and at one-minute intervals for the feedback sessions. Rating was in accordance with methods developed by Thelen for his Behavioral Rating System.[1]

Reliability and Validity

Ratings of audio tape recordings were chosen in preference to live ratings. Hare[2] has concluded that " . . . in actual research only verbal behavior is usually recorded, or at most, overt or easily identifiable attempts of one person to communicate with another." Watson compared ratings of work-emotionality behaviors from tape recordings with live ratings of work-emotionality behaviors for

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[1]Herbert Thelen, et al., Methods for Studying Work and Emotionality in Group Operation (Chicago: University of Chicago, Human Dynamics Laboratory, 1954).

[2]Hare, p. 63.

the same sessions.[1] His comparisons were for nineteen and fifteen-minute periods. Results showed eighty-six percent agreement for the nineteen-minute segment and eighty-four percent for the fifteen-minute period. His conclusion was that work-emotionality behaviors can be rated effectively from tape recordings.

Two naive judges were given operational definitions of the work and emotionality categories. After study, two random sessions were chosen for them to rate individually. Rating at three-minute intervals, they attained agreement on eighteen of twenty ratings for an agreement percentage of ninety. They practiced on additional sessions, rating at one-minute intervals, until they achieved eighty-six percent agreement on ratings of predominant work-emotionality behaviors. At this point it was felt sufficient agreement existed for raters to independently rate all sessions.

After rating all problem-solving and feedback meetings, the two raters had 468 common ratings. They showed agreement on 412 of these for a percentage agreement of eighty-eight.

The formula for applying a t-test of significance to percentage agreement, as suggested by Guetzkow,[2] was followed. Since only about half the categories were used in the final coding results, it was decided to apply a more rigorous t-test than if all categories were figured in the calculation. Consequently, as suggested by

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[1]Watson, "The Dynamics of Expectations and Adaptation to Adult Learning Group Cultures," p. 61.

[2]Harold Guetzkow, "Unitizing and Categorizing Problems in Coding Qualitative Data," Journal of Clinical Psychology, VI, No. 1 (January, 1950), 49-50.

Watson,[1] half the number of categories -- twelve -- were used. The resulting t value was 63.2 for an N of 468. This was significant beyond the .0001 level. Judges restudied and discussed discrepant ratings and reached agreement on all interaction units. A final corrected score was reported for each session.

Scoring and Statistical Analysis

Results were inspected to determine the group culture for each session and for the feedback sessions. Changes in group culture after computer, hand-tabulated, and corresponding no-feedback conditions were inspected to determine the effects of feedback on the existing basic assumption culture. A sign test was applied to determine if directional change within hand-tabulated feedback, computer-assisted feedback, and corresponding no-feedback groups occurred in the basic assumption culture.

Case Studies

Instrumentation and Data Collection

All subjects were students in the nursing curriculum at the University of Wisconsin. Two case studies were developed for the experimental sessions which combined the technical content of nursing and applications in the field of education. Copies of the studies are in Appendix B.

Each study presented an incomplete problem situation along with eight plausible alternatives for the problem's solution.

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[1]Watson, "The Dynamics of Expectations and Adaptation to Adult Learning Group Cultures," pp. 70-71.

Students were to apply their technical knowledge in both nursing and education in working with the alternatives.

Four-man group interaction sessions began with the distribution of a case study. Students were to read the study individually and rank order the eight solutions from the one they thought was most desirable and should be done first, to the one they felt was least desirable and should be done last. After each student rank ordered solutions privately, the four subjects worked as a group and determined a single group rank order for the answers. A total of thirty minutes was allowed for individual and group work before stopping students. After a series of tests and a diversity of feedback conditions, all groups worked on the second case study in an identical manner.

Reliability and Validity

The three case studies were submitted to three faculty members in the School of Nursing for guidance on content and for analysis of solutions. The three nursing professors discussed the possible answer alternatives and arrived at a single rank ordering for each study. The final order of answers they selected was considered the objective standard against which student solutions were measured. In addition, they selected the two studies they felt were most nearly equal in terms of difficulty and expertise required for solution. These two were used in the group meetings.

The concept of using absolute deviation scores as a measure of individual and group problem solution adequacy was originally

developed by Hall, Mouton, and Blake.[1] They used member deviation scores from a correct solution to determine differences between pooling of answers and group interaction in small group problem-solving tasks. Hall and Williams[2] used the same procedure in comparing decision making procedures for ad hoc versus established groups, and they further developed the Decision Adequacy Index, the Conflict Index, and the Creativity-Compromise Index used in this study. Calculations and comparisons of Indexes were based on procedures developed by Hall and Williams.[3]

Scoring and Statistical Analysis

Deviation scores are calculated by comparing the rank order of two sets of solutions. If a person ranks a solution first and the correct solution has that score ranked seventh the deviation between the subject's answer and the correct answer is six. If a person ranks a solution second which is correctly ranked first the deviation of one is noted. The sum of the absolute values of all deviation scores for a subject becomes his summed individual deviation score. The average of the individual deviation scores for the members of a group is the average individual score for that group.

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[1]Ernest J. Hall, Jane S. Mouton, and Robert R. Blake, "Group Problem Solving Effectiveness Under Conditions of Pooling Versus Interaction," The Journal of Social Psychology, LIX (1963), 147-57.

[2]Hall and Williams, pp. 214-22.

[3]Ibid., pp. 215-16.

Deviation scores can also be calculated for group answers. A group ranking of an answer can differ from the correct ranking. Thus a group may rank an answer third that the correct answer has ranked eighth. A deviation score of five results. The sum of the absolute values of all deviation scores for a group becomes the group deviation score.

Deviation scores are inversely related to accuracy. The smaller the deviation score the more nearly correct is a set of answers. Deviation scores were used in computing three different indexes: the group Productivity Index, the group Utilization of Resources Index, and the group Creativity-Compromise Index.

The group Productivity Index involved the group deviation scores for the twenty-four groups of four. Group deviation scores were calculated for both case study sessions. The group deviation score for each session was taken as the group Productivity Index of the group for that session. The larger the score, the larger the error, the less the accuracy of the group product.

The sign test was used to test changes in accuracy of group product between case study sessions. Change was analyzed within two combinations of groups: groups receiving feedback -- both computer-assisted and hand-tabulated -- and groups receiving no feedback -- both computer-assisted and hand-tabulated. The sign test examined positive and negative change between case sessions in each of these types of groupings.

The Utilization of Resources Index was expressed for each case session as the difference between the average individual

deviation score and the group deviation score. A positive Index indicated beneficial use of group resources. A positive score showed that the group used the information from group members in such a way that group answers tended to reflect the insights of the group's most knowledgable members. A negative Index indicated poor use of group member resources. Groups with negative scores failed to use the information in the group to advantage. Therefore group answers did not reflect the insights of the group's most knowledgeable members.

The sign test was used to test changes in group Utilization of Resources Indexes between the two problem-solving sessions. Change was analyzed within two combinations of groups: groups receiving feedback and groups receiving no feedback. The sign test analyzed positive and negative change between case sessions in each of these types of groupings.

The group Creativity-Compromise Index began with an analysis of group emergent solutions. An emergent solution was determined when the group solutions ranked an answer in a position in which no group member had ranked that answer individually. The group chose a new position for an answer not anticipated in the rankings of any member. Thus, if a group ranked a solution second, and no group member ranked that solution second, it was an emergent solution. The deviation score of each group emergent solution from the correct position of that solution became an emergent solution deviation score. The sum of the absolute values of the emergent

solution deviation scores for each group produced a group emergent soltuion deviation score for each case study session.

Each group member had a ranking for each emergent solution. Comparison of a group member's ranking of an emergent solution with the correct ranking for that solution provided an emergent solution deviation score for individuals. Summing the absolute values of the emergent solution deviation scores for each individual provided an individual emergent solution deviation score. The average of the individual emergent solution deviation scores for the members of a group produced an average individual emergent solution deviation score.

The group Creativity-Compromise Index for each session was expressed as the difference between the average individual emergent solution deviation score and the group emergent solution deviation score. A positive Index demonstrated creativity; a negative Index, compromise. When positive, the average individual emergent solution deviation score is larger than the group emergent solution deviation score. Thus the group emergent solution deviation score is more adequate than the average individual emergent solution deviation score. The group developed more unique and more accurate answers through group problem solving than were available from any one group member. The group has been creative.

When the Index is negative, the average individual emergent solution deviation score is smaller than the group emergent solution deviation score. Thus the group emergent solution deviation score is less adequate than the average individual emergent solution

deviation score. In reaching a group solution, group members gave in to incorrect answers not originally found in any group member's solution. There has been compromise within the group.

The sign test was used to evaluate changes in group Creativity-Compromise Indexes between the two problem sessions. Changes were analyzed within two combinations of groups: groups receiving feedback and groups receiving no feedback. The sign test examined positive and negative change between case sessions for each of these types of groupings.

Semantic Differential

Instrumentation and Data collection

A Semantic Differential was administered three times to all subjects. Two similar topics were measured: "my small group meetings" before experimentation and on the last day of the semester, and "tonight's small group meeting" after the experimental sessions. The Differential was aimed at evaluating the impressions made by problem-solving sessions. By taking measures at three points, changes could be evaluated before experimentation, during experimental sessions, and at the end of the semester. Changes within computer-assisted and hand-tabulated feedback conditons, and within their corresponding no-feedback control groups over the three points in time, were analyzed. A copy of the Semantic Differential is in Appendix B.

Reliability and Validity

The semantic differential methodology refined by Osgood was used for experimentation. The thirty-two differential scales measured were constructed by Boyd.[1] Bi-polar differential scales are deceptive in that their use and analysis make scaling assumptions which classify the differential as a marginal interval measure. Summing across scales and calculating means in factor analysis entails three assumptions: the property of equal intervals is assumed within each scales, equal intervals are assumed between points on different scale, and scales are assumed to have a measurable zero point. Research is cited by Osgood[2] which explores these assumptions and makes their acceptance appear justified. In addition, Osgood describes extensive research demonstrating item reliability of his semantic differential scales over time, face validity and predictive validity of his differential instrument, and the content validity of his semantic factors.[3] Reliability and validity research, combined with experimental evidence of the sensitivity of Osgood's instrument, and the comparability of his instrument across subjects, makes his arguments for the use of the

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[1]Robert D. Boyd, "Semantic Differential Test," unpublished, University of Wisconsin, 1963.

[2]Charles E. Osgood, George J. Suci, and Percy H. Tannenbaum, The Measurement of Meaning (Urbana, Ill.: University of Illinois Press, 1967), pp. 125-88.

[3]Ibid., pp. 126-46.

semantic differential impressive.[1] Osgood's work led to acceptance of limited parametric assumptions in analyzing differential scores of ordinal value in this study.

The thirty-two scales constructed by Boyd were in agreement with Osgood's methodology. Scales were chosen which formed true dichotomies,[2] which were meaningful to subjects,[3] and which were unidimensional in what they individually measured.[4]

Osgood found that sets of scales do not have common factors of semantic meaning over all possible concepts. There is typically a significant interaction between concepts and scales which influences factor composition.[5] Factor analysis of Boyd's scales to determine dimensions of meaning for experimental concepts was deemed necessary.

Therefore, the author factor analyzed scores on the thirty-two scales with a sample of 360 students who measured two subjects, at two points in time. The subjects -- "lecture sessions" and "small group meetings" -- were similar to the subjects to be used in the research. An Image Analysis Procedure was performed and

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[1] Ibid., pp. 166-76.

[2] Abraham N. Oppenheim, Questionnaire Design and Attitude Measurement (New York: Basic Books, Inc., 1966), p. 206.

[3] Claire Selltiz, Research Methods in Social Relations (New York: Holt-Rinehart, 1959), p. 356.

[4] Bert F. Green, "Attitude Measurement," in Handbook of Social Psychology, ed. by Gardner Lindzey (Cambridge, Mass.: Addison-Wesley Publishing Co., 1954), p. 339.

[5] Osgood, pp. 176-88.

results were rotated orthagonally by the Varimax method.[1] Three distinct factors of semantic meaning were found. Establishment of these factors gave evidence that the instrument, with the subjects and scaling used, was a valid measure for these factors.

Scoring and Statistical Analysis

Factor scores were calculated for each subject. Three factor scores were computed for each subject for each of the three administrations of the Differential. Thus each subject had nine factor scores, three for each of three administrations of the instrument.

For each of the three factors in each administration of the instrument, scores were partitioned into four divisions: scores for subjects receiving computer-assisted feedback, scores for subjects receving hand-tabulated feedback, and scores for each of the corresponding no-feedback control conditions. Thus there were four divisions of scores, for each of three factors, during each of three administrations of the instrument.

Sign tests tested changes in each of the four groupings for each of the three factors over three points in time: the pre-experimental and post-experimental administration of the instrument, the post-experimental and the last day of class administration of the instrument, and the pre-experimental and last day of class administration of the instrument. Results should show changes in the three-

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[1]The "FACTOR 1" program of the "STATJOB" statistical library at the University of Wisconsin Computing Center was used for these calculations.

factor meaning of "small group meetings" for the four groupings of subjects over three points in time.

Shaw Task Dimension Scale

Instrumentation and Data Collection

Shaw[1] isolated six dimensions which are common to all group tasks. During experimental sessions, each four-man group subdivided their problem-solving sessions into a series of successive group tasks. The number and names of the tasks were agreed upon by group discussion. Individuals within each group then rated each of these successive tasks on a five point scale for each of Shaw's six dimensions for tasks. Rating was completed for each case study. Thus each group task for each case study had six Shaw Scale ratings for each subject. A copy of the Shaw Task Dimension Scale is in Appendix B.

During each group meeting prior to the experimental session and in each meeting after the session, the Shaw Scale was used as a group rather than an individual instrument. For each meeting, groups of eight designated observers. Observers rotated from meeting to meeting, defined successive group tasks occurring during each meeting, and rated each of the designated tasks on each of Shaw's six scales. Therefore, each group task, for each pre and post-experimental eight-man group meeting, had one set of six Shaw Scale ratings for the group.

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[1]Marvin E. Shaw, "Scaling Group Tasks: A Method for Dimensional Analysis" Technical Report No. 1, Office of Naval Research Contract NR 170-226 (Gainsville, Fla.: Department of Psychology, University of Florida, 1963).

Reliability and Validity

Marvin Shaw[1] developed the Task Dimension Scale through a U. S. Navy research grant. He initially selected 104 small group tasks from examining the experimental literature, from analyzing investigations of small group research, and by creating unique tasks for his experiment. He then hypothesized ten dimensions common to all these tasks based on a priori and theoretical grounds. Dimensions were derived by trial and error quasi logical processes, from his own experiences, and from consulting other social psychologists.

The Thurstone and Chave method[2] for scaling was used in selecting forty-nine judges to rate each of the 104 tasks along ten dimensions. The scoring of the 104 tasks along the dimensions resulted in a final total of 1040 scale values. Two factor analyses and accompanying factor rotations were performed on these results. Six dimensions of group tasks resulted: difficulty, solution multiplicity, cooperation requirements, intellectual-manipulative requirements, population familiarity, and intrinsic interest. These were considered the dimensions of small group problem-solving tasks.

Scoring and Statistical Analysis

Scales four and five of the Shaw Scale were not considered relevant to this study. However, since the Shaw test was used

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[1] Ibid.

[2] L. L. Thurstone and E. J. Chave, The Measurement of Attitudes cited by Oppenheim, Questionnaire Design and Attitude Measurement, pp. 125-33.

throughout the semester, the scales were administered during experimentation to maintain continuity. The data for scales four and five were analyzed, found non-significant as expected, and not reported in the results.

For each group member in each case session, the median score over all pre-determined tasks was calculated for each scale on the Shaw Task Dimension Scale. For each scale, a person's median score over all tasks in a case study session was considered representative of his subjective reactions on that scale. Each member of a four-man group thus had four median scores for each case -- one on each of four scales.

Median values were computed for group members on all four scales for each of two experimental case studies. For each case study, scores on each scale for all four-man groups were grouped into four divisions: computer-assisted feedback scores, hand-tabulated feedback scores, and scores for the two corresponding control conditions. Sign tests were used to test changes in group member scale scores in each of the four divisions between case studies. Sign tests analyzed positive and negative changes in individual median values for four conditions within each of four scales.

Ratings on the Shaw Scale were also available from the eight-man small group meetings prior to and after experimentation. Therefore, long-term analysis of Shaw Scale scores was possible. Since in pre and post-experimental sessions the Shaw Scale was used as a group instrument, four-man experimental results for individuals

had to be compared with eight-man pre and post-experimental results for groups. In evaluating each of the four Shaw Scales, a chi square test was used.

It is recognized that using pre-experimental group level responses for eight-man groups to analyze individual responses in experimental four-man groups is a tenuous procedure. However, the use of natural groups did not permit either the segregation of pre-experimental groups of eight into experimental groups of four or the use of the Shaw Task Dimension Scale as an individual pre-experimental instrument.

Chi square examined changes in Shaw Scale scores between eight-man pre-experimental sessions and each four-man experimental case study for four types of response sets: computer-assisted feedback, hand-tabulated feedback, and each of the corresponding control conditions. Chi square examined changes in scale scores between eight-man pre-experimental sessions and eight-man post-experimental sessions for two types of response sets: computer experience and experimenter experience.

In making these analyses, responses for all eight-man group meetings on each of the Shaw Scales prior to experimentation were divided into two sections: computer experience scores and experimenter experience scores. There was an identical division of responses for all sessions after experimentation. Each of these divisions was grouped in a frequency distribution for each scale. There were thus two frequency distributions for each of four scales for pre and post-experimental data.

Individual responses for each four-man experimental session on each scale for each case study were grouped in a frequency distribution. Scores within scale groupings were further combined into four sections: computer-assisted feedback, hand-tabulated feedback, and the two corresponding control conditions. There were thus four frequency distributions for each of four scales for experimental data.

Sectioned and grouped responses of eight-man groups prior to experimentation became the standard for estimating expected frequencies of responses for grouped and sectioned four-man groups during experimentation and for sectioned and grouped eight-man groups in post-experimental meetings. Chi square determined if observed responses during four-man experimental case sessions in fact differed from expected frequencies derived from eight-man pre-experimental sessions for the two feedback and the two control conditions on each scale. Sixteen chi square tests were therefore run with experimental data.

Chi square also tested if observed responses in eight-man meetings after experimental sessions in fact differed from expected frequencies derived from eight-man pre-experimental sessions for computer experience and experimenter experience conditions on each scale. Eight chi square tests were therefore run with post-experimental data.

Experimental case study differences were considered evidence of the effects of the research environment. Post-experimental

differences were evaluated as permanent change brought about by experimental conditions.

Rating Scales

Instrumentation and Data Collection

After the initial case study sessions, four-man group members rated each other. Affective feedback was based on these subjective ratings by each group member of every other group member. Each subject had the two behaviors he wanted to see most -- his culture preference behaviors -- presented to him for rating. A three-dimensional scale was used to evaluate every other person's activity -- their affective approach behaviors -- in comparison with desired culture preference behaviors. The integrated three dimensional scale had a seven-point scale of satisfaction with other member's performance of an ideal behavior, a six-point scale showing degree of activity of other members relative to an ideal behavior, and a three-point scale on doing more, doing less, or staying the same with regard to an ideal behavior. Each group member used this three-dimensional scale to evaluate every other member on the ideal behaviors he wanted to see. The rating scale is on page 111.

Feedback occurred when every member received the statements of every other member. In addition, each member was shown how he was rated by each other member on these statements. Thus each group member knew every other group members' ideal behaviors, how active he was on those behaviors, how satisfied others were with

ILLUSTRATION OF
RATING SCALE

SATISFACTION

			Dissatisfaction					Satisfaction
			High 1	Moderate 2	Slight 3	Slight 4	Moderate 5	High 6
Activity	High	7	71	72	73	74	75	76
	Very Much	6	61	62	63	64	65	66
	Much	5	51	52	53	54	55	56
ACTIVITY	Some	4	41	42	43	44	45	46
	Little	3	31	32	33	34	35	36
	Very Little	2	21	22	23	24	25	26
Inactivity	None	1	11	12	13	14	15	16

FUTURE PERFORMANCE

Do More = Add 100

Do Less = Add 200

Stay The Same = Add 300

his performance on those behaviors, and how others wanted him to behave in the future with regard to those behaviors.

Feedback was either supplied by computer typewriter or hand tabulation, or it was withheld. After discussion of feedback results, group members worked on a second case study. All members again rated all other members after the second study, but feedback results were not given to any subjects.

Reliability and Validity

The problem of establishing validity with rating scales has been stated by Selltiz:

> Perhaps the most significant problem in the use of rating scales has been with their validity. Even a cursory examination of the relevant literature reveals that, whereas evaluation of the reliability of rating scales is common, measures of validity are rarely reported. The reason, of course, is the dearth of available external criteria against which ratings can be compared.[1]

Selltiz goes on to spell out criteria which rating scales should meet. To meet the conditions of reliability and validity, scales should be constructed so that:

> . . . (1) attributes being measured were relatively 'objective,' so that their meaning would be uniformly understood by the raters using the scales; (2) the ratings themselves were obtained under optimal conditions, including carefully constructed scales, trained judges, and specified frames of reference.[2]

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[1]Selltiz, p. 356.

[2]Ibid.

Other qualifications of scales applicable to this study are enumerated by Guilford.[1] He says that traits to be rated should be introduced with a trait name and a definition in operational terms, and that each trait should refer to a single type of activity. Raters should be given the same clear, univocal conception of the continuum along which objects are to be evaluated, and raters should be given sufficient time for making ratings.

In following these guidelines, each group member was given a copy of the rating scale. The separate scales and the uses of each scale were then fully explained. Questions were clarified, and subjects were given a series of examples demonstrating application of the scales. Students were given hypothetical reactions and quizzed individually on what the ratings for those reactions should be. At the end of the training session, all subjects acknowledged that they were fully acquainted with the conception and application of the rating scales. No time limit was placed on completing the rating procedure.

Scoring and Statistical Analysis

Changes in ratings by each member were evaluated on all three scales. Two analyses attempted to determine if increased congruency between individual culture preference behaviors and other member affective approach behaviors developed over the two case sessions.

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[1]J. P. Guilford, Psychometric Methods (2nd ed.; New York: McGraw-Hill Book Co., Inc., 1954), pp. 292-96.

One analysis measured the change in satisfaction scores over the two sessions by means of a sign test. Scores for each case session were partitioned for all individuals into four groupings: computer-assisted feedback, hand-tabulated feedback, and the two corresponding no-feedback control conditions. Sign test analyses examined positive and negative changes in satisfaction between case sessions for these four groupings. Positive sign test results indicated increased congruency between individual culture preference and other member affective approach behaviors. Negative results indicated a decrease in congruency.

The second analysis involved evaluation of the two activity scales with a sign test. Each member indicated the degree of activity observed in other members for two specific preferred behaviors on a six-point activity scale. He further indicated on a three-point scale whether he wanted other members to do more, do less, or stay the same for the two preferred behaviors. The second six-point activity ratings did or did not show a change in the desired direction as indicated in the original three-point scale. Six-point activity ratings which stayed the same when told to do so, or which changed in the directions indicated by feedback instructions, were given a plus in the sign test analysis. Six-point activity ratings which showed no change when told to do so, or which changed in directions opposite to feedback instructions, were given a minus in the sign test analysis.

Plus and minus sign test scores for all groups were grouped into four conditions: computer-assisted feedback, hand-tabulated

feedback, and the two corresponding no-feedback control conditions. Sign test analyses examined positive and negative changes in activity for these four conditions. Positive sign test results indicated increased congruency between individual culture preference and other member affective approach behaviors. Negative results indicated a decrease in congruency.

Member Questionnaire

Instrumentation and Data Collection

The Member Questionnaire measured perceived feelings of cohesiveness among group members. The Questionnaire consisted of eleven Likert-type summated scales which measured a common attitude by means of eleven rated statements. Possible responses to statements were made on a six-point continuum of alternatives. Scores of one through six were summed across the eleven scales to arrive at a total value for perceived cohesiveness for each subject. The instrument is in Appendix B.

The Questionnaire was administered twice during the experimental sessions. After the first case study, all four-man group members filled out the Questionnaire in terms of the interaction they had just experienced. The Questionnaire was filled out again after the second case study and with direct reference to the second interaction session.

Reliability and Validity

The Member Questionnaire was developed at the University of Kansas as part of a course in Human Relations. The Questionnaire was used in "Human Relations in Group Interaction I" and was published in the class workbook.[1]

For the eleven Likert scales, there was no external referent against which responses could be measured in establishing reliability and validity. In analyzing the scale, two factors proved important: homogeneity of content and internal consistency of measurement. Oppenheim discussed the problem and the methodology in determining reliability and validity of Likert scales when he said:

> . . . the best available measure of the attitude concerned is the total item pool that we have so carefully constructed. By purifying this, the items will at least be consistent and homogeneous -- they will be measuring the same thing -- and the scale may possibly also be valid.[2]

Green has stated that:

> In general, if the items on a scale are highly interdependent, then the items are homogeneous and the scale is unidimensional.[3]

The results of the Member Questionnaire were submitted to a RAVE[4] analysis to determine internal consistency. A Hoyt Reliability

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[1]University of Kansas, Student Workbook for Human Relations in Group Interaction I (Lawrence, Kansas: University of Kansas, 1966), part 3.

[2]Oppenheim, p. 138.

[3]Green, p. 339.

[4]The "RAVE" portion of the "GITAP" program in the statistical library at the University of Wisconsin Computing Center was used for this calculation.

of .770 was found demonstrating that the items are highly interrelated and thus the instrument is measuring a singular attitude.

Scoring and Statistical Analysis

A sign test was used to evaluate changes in total score response between problem-solving sessions. Scores were grouped for those subjects receiving computer-assisted feedback, those receiving hand-tabulated feedback, and for their corresponding no-feedback control groups. The sign test was applied to changes in scores within computer and hand-tabulated feedback groups and within the two no-feedback control conditions. Sign tests analyzed positive and negative changes in scores within these four conditions.

Leveling Scale

Instrumentation and Data Collection

The Leveling Scale measured the degree to which group members were open or closed in expressing their feelings on the problem-solving task during group interaction. The instrument was a singular linear nine-point ordinal scale which allowed for scoring from "completely closed and not expressing feelings during interaction" to "completely open and expressing all feelings during interaction." A response alternative for no feeling was also provided. A subjective Leveling score was given by each group member to each mutually agreed upon task during problem-solving sessions. A copy of the instrument is in Appendix B.

The instrument was administered after each case study session to all members in each group of four. Openness was scored for each task during the immediately preceding study. During each of the eight-man group meetings prior to experimentation and during each meeting after research group members individually responded on the instrument. Here too, a score was given for each of the tasks the group undertook.

Reliability and Validity

The instrument was developed by Robert Blake and Jane Mouton[1] in the Training Laboratory at the University of Texas. From their experiences at the Laboratory, forty, nine-point rating scales analyzing different aspects of group interaction were developed and employed in their activities. Factor analysis of scores on these forty scales reduced the number of significant scales to eleven. One of the eleven scales was the Leveling Scale. A later version of the Leveling Scale[2] has been developed into a triangular matrix.

Scoring and Statistical Analysis

The median score for each person over the number of predetermined tasks for each case study was considered each person's

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[1]R. R. Blake, J. S. Mouton, and B. Fruchter, "A Factor Analysis of Training Group Behavior," Journal of Social Psychology, CXXVI (1962), 56-58.

[2]Irving R. Weschler and Edgar Schein, eds., Selected Readings, Series Five: Issues in Training (n. p.: National Training Laboratories, National Education Association, 1962), pp. 64-66.

Leveling score for that study. The median value represented the predominant leveling a person expressed during a case study session. For each of two case study sessions one median score for each group member was noted. Scores for computer-assisted feedback groups, hand-tabulated feedback groups, and their corresponding no-feedback control groups were grouped for comparison between case sessions. A sign test was applied to changes within computer-assisted feedback and hand-tabulated feedback groups and to changes within each of their corresponding no-feedback control conditions. Sign tests analyzed positive and negative changes in median scores within each of the four groupings.

Leveling scores were available for pre and post-experimental sessions for all individuals in eight-man groups. Pre-experimental sessions, case study sessions, and post-experimental sessions were compared with chi square tests.

Two separate analyses were made. In one analysis, each pre-experimental group of eight was partitioned into experimental session groups of four. Chi square examined changes in Leveling scores between partitioned four-man pre-experimental sessions and each four-man experimental case study.

In making this analysis, responses for all partitioned four-man groups on the Leveling Scale prior to experimentation were divided into four sections: computer-assisted feedback, hand-tabulated feedback, and the two corresponding control conditions. These sections were each grouped in a frequency distribution. There were thus four frequency distributions for pre-experimental data.

Individual responses for each four-man experimental session were grouped in a frequency distribution. These groupings were further combined into four sections: computer-assisted feedback, hand-tabulated feedback, and the two corresponding control conditions. There were thus four frequency distributions for experimental data.

Sectioned and grouped responses of partitioned four-man groups prior to experimentation became the standard for estimating expected frequencies of responses for grouped and sectioned four-man groups during experimentation. Chi square determined if observed responses during four-man experimental case sessions in fact differed from expected frequencies derived from partitioned four-man pre-experimental groups for the two feedback and the two control conditions. Four chi square tests were applied with experimental data. Experimental case study differences were considered evidence of the effects of the research environment.

It is recognized that the parceling of individual pre-experimental responses for eight-man groups into experimental four-man sections for purposes of four-man experimental session analysis is a tenuous procedure. However, the use of natural groups did not permit the segregation of pre-experimental groups of eight into experimental groups of four.

In the second analysis, each pre-experimental group of eight was divided into computer experience and experimenter experience sections. Each of these sections was grouped in a frequency distribution. There were thus two frequency distributions for pre-experimental data.

Responses for all eight-man post-experimental meetings were also divided into computer-experience and experimenter-experience sections. Each of these sections was grouped in a frequency distribution, giving two frequency distributions for post-experimental data.

Sectioned and grouped responses of eight-man groups prior to experimentation became the standard for estimating expected frequencies of responses for sectioned and grouped eight-man groups in post-experimental meetings. Chi square determined if observed responses in eight-man meetings after experimental sessions in fact differed from expected frequencies derived from eight-man pre-experimental sessions for the computer experience and the experimenter experience conditions. Two chi square tests were run with post-experimental data. Post-experimental differences were considered evidence of permanent change brought about by experimental conditions.

Decision Making Procedures Check List

Instrumentation and Data Collection

The Decision Making Procedures Check List measured the decision-making procedures which group members perceived during problem solving. The instrument involves a list of nine decision making procedures which are used by groups in reaching decisions during problem-solving. Decision can be: "thought and feeling consensus, self-authorized decision, majority support of a position"

and six more. The complete instrument is in Appendix B. A Decision Making Procedure was given by each group member for each group determined task during both case study sessions.

The instrument was administered after each case study to each group of four. The predominant decision-making procedure for each group task was to be indicated by each group member. During each of the group meetings prior to experimental sessions and during each meeting after the sessions, all individuals in groups of eight responded on the instrument. Again in these meetings, the predominant decision making procedure was listed for each group task.

Reliability and Validity

The Check List was developed by Robert Blake and Jane Mouton[1] in the Training Laboratory at the University of Texas. From their experience, from reviewing the research literature, from theory, and from experimental trial and error, decision-making procedures were defined which described decision practices occurring in small problem-solving and laboratory training groups. Revision of the instrument through experimentation led to a final list of nine procedures.

The Decision Making Procedures Check List as constructed and used by Blake and Mouton was considered a nominal scale. The author felt that the nine decision procedures had ordinal properties. There appeared to be an increase in quality of decision procedures on a

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[1] Ibid.

continuum, as progression moved from procedure on through procedure nine.

To establish ordinal properties for the scale, five naive judges were given the nine procedures typed on cards. They were asked to rank the procedures from the one they felt was of highest quality, and most desirable within a small decision making group, to the one they felt was least desirable.

The scores for the five judges were recorded, and Spearman Rank Order Correlations were computed between the scores and the initial order of procedures as listed by Blake and Mouton. The rank order correlations for eleven rankings of five judges were .90, .84, .81, .79, and .77 respectively, all significant beyond the .01 level. These results justified using the Decision Making Procedures Check List as an ordinal scale in which decision procedures increased in quality on a continuum from "Plop (Suggestion failed to be picked up resulting in decision not to consider the proposal)" to "Thought and feeling consensus (Unanimity)".

Scoring and Statistical Analysis

The median score for each person over the number of predetermined tasks for each case study was considered each person's Decision Procedures score for that study. The median value represented the predominant decision-making procedure a person perceived during a case study session. For each of two case study sessions one median score for each group member was noted. Scores for computer-assisted feedback groups, hand-tabulated feedback groups,

and their corresponding no-feedback control groups were grouped for comparison between case sessions. A sign test was applied to changes within computer-assisted feedback and hand-tabulated feedback groups and to changes within each of their corresponding no-feedback control conditions. Sign tests analyzed positive and negative changes in median scores within each of the four groupings.

Decision Procedures scores were available for pre and post-experimental sessions for all individuals in eight-man groups. Pre-experimental sessions, case study sessions, and post-experimental sessions were compared with chi square tests.

Two separate analyses were made. In one analysis, each pre-experimental group of eight was partitioned into experimental session groups of four. Chi square examined changes in Decision Procedures scores between partitioned four-man pre-experimental sessions and each four-man experimental case study.

In making this analysis, responses for all partitioned four-man groups on the Decision Procedures Check List prior to experimentation were divided into four sections: computer-assisted feedback, hand-tabulated feedback and the two corresponding control conditions. These sections were each grouped in a frequency distribution. There were thus four frequency distributions for pre-experimental data.

Individual responses for each four-man experimental session were grouped in a frequency distribution. These groupings were further combined into four sections: computer-assisted feedback,

and the two corresponding control conditions. There were thus four frequency distributions for experimental data.

Sectioned and grouped responses of partitioned four-man groups prior to experimentation became the standard for estimating expected frequencies of responses for grouped and sectioned four-man groups during experimentation. Chi square determined if observed responses during four-man experimental case sessions in fact differed from expected frequencies derived from partitioned four-man pre-experimental groups for the two feedback and the two control conditions. Four chi square tests were applied with experimental data. Experimental case study differences were considered evidence of the effects of the research environment.

It is recognized that the parceling of individual pre-experimental responses for eight-man groups into experimental four-man sections for purposes of four-man experimental session analysis is a tenuous procedure. However, the use of natural groups did not permit the segregation of pre-experimental groups of eight into experimental groups of four.

In the second analysis, each pre-experimental group of eight was divided into computer experience and experimenter experience sections. Each of these sections was grouped in a frequency distribtuion. There were thus two frequency distributions for pre-experimental data.

Responses for all eight-man post-experimental meetings were also divided into computer experience and experimenter experience

sections. Each of these sections was grouped in a frequency distribution, giving two frequency distributions for post-experimental data.

Sectioned and grouped responses of eight-man groups prior to experimentation became the standard for estimating expected frequencies of responses for sectioned and grouped eight-man groups in post-experimental meetings. Chi square analyses determined if observed responses in eight-man meetings after experimental sessions in fact differed from expected frequencies derived from eight-man pre-experimental sessions for the computer experience and the experimenter experience conditions. Two chi square tests were run with post-experimental data. Post-experimental differences were considered evidence of permanent change brought about by experimental conditions.

Statistical Treatment of the Data

The assumptions of parametric statistics were difficult to meet within the present study. Siegel outlines the assumptions behind parametric methods which could not be established for this research:

> 2. The observations must be drawn from normally distributed populations . . .
> 4. The variables involved must have been measured in at least an interval scale . . .[1]

Considering the highly segregated population used -- third-year female nursing students -- the assumptions of normality seemed tenuous. In addition, the scales of measurement employed were ordinal, not interval. These constraints led to rejection of parametric methods for analysis.

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[1]Sidney Siegel, Nonparametric Statistics (New York: McGraw-Hill Book Co., 1956), p. 19.

On only one instrument was parametric analysis used. Osgood[1] has performed extensive research on the semantic differential and has established the applicability of parametric methodology to selected manipulations of semantic scales.

Non-parametric techniques were chosen for all other analyses. The sign test and chi square were applied to results. Also, a series of deviation score measures, devised by Hall and Williams,[2] were used in handling ordinal ranking scores.

In analysing specific hypotheses, one of two kinds of groupings was applied to the data. In one grouping, responses were divided into computer-assisted feedback, computer-assisted no-feedback, hand-tabulated feedback, and hand-tabulated no-feedback sections.

Sign test analyses tested if positive or negative changes in scores within each of these sections were significantly different from zero. However, direct statistical comparisons between results in these sections were not made. Conclusions as to differences between sections were drawn from direct inspection of sign test outcomes. It is recognized that such a procedure is non-statistical and must be used with caution.

It is also recognized that use of sign tests in analyzing changes in individual scores assumes independence of individual scores within four-man groups. In fact, such an assumption is not accurate, group interaction tends to influence individual responses.

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[1]Osgood, pp. 125-88.

[2]Hall and Williams, pp. 214-22.

However, the focus of this study was on change in inter-member behavior within four-man groups. This focus on individual group member response led to use of the sign test with reservations about the assumption of independence.

Figure 8 shows the test measures taken and the hypotheses each test explored. In addition, the Figure shows which tests were used for pre-experimental session, experimental session, and post-experimental session analysis. The statistical techniques used to evaluate each test indicate the time at which that test was used in the research. Statistical techniques are indicated in the cell which shows the pre-experimental, experimental, or post-experimental point in the study for which the test gave results.

Tests	Hypotheses Investigated	Pre-Experimental Measures	Experimental Intervention Measures	Post-Experimental Measures
Ideal Group Q Sort Perceived Group Q Sort				
Ratings of Audio Tape Recordings	X		Sign Test	
Case Studies	III, IV, V		Sign Test	
Semantic Differential	XIII	Sign Test	Sign Test	Sign Test
Shaw Task Dimension Scale	VI, VII, VIII, IX	Chi Square	Sign Test	Chi Square
Rating Scales	IA, IB		Sign Test	
Member Questionnaire	XI		Sign Test	
Leveling Scale	XII	Chi Square	Sign Test	Chi Square
Decision Making Procedures Check List	II	Chi Square	Sign Test	Chi Square

Fig. 8.--Statistical treatment of the data

CHAPTER IV

ANALYSIS OF THE DATA

Organization of the Data

Data were organized into three phases for analysis: pre-experimental data, experimental intervention data, and post-experimental data. Pre-experimental data described how subjects should have responded in experimental sessions and contrasted these typical responses with actual developments. Experimental intervention data examined changes which occurred within experimental sessions, and post-experimental data evaluated effects of experimentation over the post-experimental life of all groups.

The pre-experimental data served two purposes. The Ideal Group Q Sort, administered two weeks prior to experimentation, provided basic information for the computer program. Q Sort results were entered into the program and later used during experimental sessions.

Pre-experimental figures also provided information on the effects of experimental intervention on the behavior within ongoing groups. Did research intervention into the life of continuing groups change typical patterns of behavior? Pre-experimental data answered this question.

Twelve of thirteen hypotheses were tested with experimental intervention data. For testing nine hypotheses, the twelve groups of

eight subjects were segregated into four divisions. Scores were grouped for all members of computer-assisted feedback groups, experimenter-assisted feedback groups, computer-assisted no-feedback groups, and experimenter-assisted no-feedback groups. For testing three hypotheses, scores were combined into feedback groups and no-feedback groups.

Post-experimental data evaluated outcomes of one hypothesis. For test purposes, there was a four-way division of the data as described above. Responses were also available to test for long-term effects of experimentation. Did affective feedback research sessions have long-term effects on the post-experimental life of ongoing groups of eight? Data were divided into feedback and no-feedback groups to answer this question.

Raw data for the summary statistics in this chapter, and the computer programs used during experimental sessions, are available from the Adult Instruction Laboratory at the University of Wisconsin. The large number of student responses made reproduction of the raw data within this manuscript prohibitive.

Pre-experimental Data

The Computer Program

The Ideal Group Q Sort measured the work-emotionality behaviors subjects wanted to see in their small instructional groups during experimental sessions. The Q Sort was administered after the groups had met for eight weeks in the semester, and results were entered into the computer program. Work-emotionality behaviors

subjects most wanted to see were reproduced by the computer typewriters during research sessions, and subjects rated others on how they performed these activities.

Examining Experimental Intervention

The question was raised in analyzing the data: Was group behavior different during experimental sessions from regular pre-experimental class periods? This question is fundamentally important because the researcher wanted to test whether intervention in a natural group changed the behavior configuration of its members. If intervention brings change, generalizations to ongoing groups from research with ad hoc and and natural groups must be made with great care.

Three tests were employed to examine the problem -- the Shaw Task Dimension Scale, the Decision Making Procedures Check List, and the Leveling Scale. The three instruments were administered in weekly small group meetings throughout the semester. To test for the possibility of significant differences in response during experimental sessions, the pre-session data were compared with experimental session data through the use of the chi square test. Results are shown in Table 1.

As an example of computations for Table 1, the 8.44 in the first column under the difficulty scale shows no significant difference between the first experimental case study and pre-experimental problem solving on perceptions of task difficulty for members of computer-assisted feedback groups. For all computer-assisted feedback groups,

TABLE 1

CHI SQUARE ANALYSIS OF MEMBERS' SCORES ON THE SHAW TASK DIMENSION SCALE, THE DECISION-MAKING PROCEDURES CHECK LIST, AND THE LEVELING SCALE FOR PRE-EXPERIMENTAL MEETINGS, AND OBSERVED SCORES FOR CASE SESSION ONE AND CASE SESSION TWO

Test	Shaw Task Dimension Scale[1]								Decision-Making Procedures Check List[2]		Leveling Scale[2]	
Scale	Difficulty		Number of Solutions		Cooperation		Interest					
Case Session	1	2	1	2	1	2	1	2	1	2	1	2
Computer-Assisted Feedback Subjects	3.44	34.33**	5.97	24.00**	27.74**	50.97**	13.22*	67.45**	3.13	21.46**	6.91	19.92*
Computer-Assisted No-Feedback Subjects	12.77*	27.11**	7.39	14.53**	17.59**	17.02**	39.91**	46.28**	8.56	19.21**	24.67**	32.62**
Experimenter-Assisted Feedback Subjects	7.15	18.89**	5.92	27.70**	36.27**	38.02**	15.66**	15.48**	18.70*	20.12**	18.14**	46.49**
Experimenter-Assisted No-Feedback Subjects	5.24*	9.26**	8.62**	8.77	19.60**	28.49**	22.12**	38.25**	29.47**	34.54**	20.64**	29.54**

*Significant to the .05 level.
**Significant to the .01 level.

[1]Four degrees of freedom
[2]Eight degrees of freedom

all responses on the five-point difficulty scale of the Shaw Task Dimension Scale were accumulated in a frequency distribution for all pre-experimental sessions. This distribution was then used to generate a hypothetical frequency distribution of responses on that scale during the first case study session. The hypothetical distribution was compared to the actual distribution of responses grouped for all computer-assisted feedback groups. The chi square test compared the two distributions to determine significant differences. All cells in Table 1 were calculated in a similar fashion. There were no cells in which twenty percent of the scale categories had fewer than five responses. Further details of this procedure are given in Chapter III.

Thirty-six of the forty-eight cells showed significant differences in response at the .05 level of significance. Thirty-two of the thirty-six significant cells showed differences at the .01 level. Differences were distributed over all four types of member groupings and over all three tests.

Thus for all three tests, there were significant differences between the pattern of responses prior to experimental sessions and the pattern during intervention. It is concluded that experimental intervention into the life of ongoing natural groups produced significant differences in member patterns of behavior. Inspection of the expected minus the observed variations for all scale categories in each cell showed major differences to be in the direction of increased perceived leveling scores, increased perceived cooperation

among group members, improved perceived decision-making procedures, and increased perceived interest in group tasks during experimentation. Semantic Differential findings, discussed later, while not employed to directly measure intervention effects, supported the conclusion that experimentation changes member behavior. No pattern was found among the non-significant findings.

Experimental Intervention Data

Introduction

Twelve hypotheses were tested with experimental data. Findings are presented in the following order: hypotheses which were not rejected, hypotheses which were partially rejected and which showed some significant findings, and hypotheses which were falsified.

Experimental Hypotheses

Hypothesis XII. Group member affective reactions to work-emotionality behaviors in the delivery channel of communication, quantified and given to all other group members as feedback data in the information channel of communication, will result in delivery channel activity during future group problem solving which is characterized by: a greater increase in the open expression of feelings toward the problem-solving task perceived among experimental group members than among control group members.

Findings. Table 2 summarizes the results of the sign test for member score changes on the Leveling Scale instrument. Computer-assisted feedback groups and hand-calculated feedback groups showed significant positive changes in member perceptions of the amount of leveling between case sessions. After feedback, member perceptions of the open expression of feeling significantly increased among group members. Increases occurred whether feedback was supplied through computer typewriters or by experimenter.

TABLE 2

SIGN TEST ANALYSIS OF POSITIVE AND NEGATIVE CHANGES IN MEMBERS' SCORES BETWEEN CASE SESSION ONE AND CASE SESSION TWO ON THE LEVELING SCALE INSTRUMENT

Subjects	Positive Change	Negative Change	No Change	Sign Test Probability
Computer-Assisted Feedback Subjects	11	3	10	.029*
Computer-Assisted No-Feedback Subjects	9	4	9	.133
Experimenter-Assisted Feedback Subjects	12	4	8	.038*
Experimenter-Assisted No-Feedback Subjects	8	5	9	.291

*Significant to the .05 level.

Hypothesis III. Group member affective reactions to work-emotionality behaviors in the delivery channel of communication, quantified and given to all other group members as feedback data in the information channel of communication, will result in analysis of problem-solving subject matter in the information channel of communication during future group problem solving which is characterized by: greater improvement in creativity of group product by the experimental group than by a control group.

Findings. Table 3 shows the results of changes in group Creativity-Compromise Indices between case sessions. When the Index is positive, creativity is indicated within the group. The more positive the number, the greater the creativity. Creative groups developed superior unique solutions not anticipated by individual members. When negative, the Index indicates compromise. The more negative the number, the greater the degree of compromise. Compromise groups rejected superior unique member solutions in reaching an inferior group product.

To obtain a sufficient sample size for analysis, computer and experimenter feedback groups were necessarily combined, as were the computer and experimenter no-feedback groups. Two samples of twelve were tested with a sign test. Feedback groups showed significant increases in movement toward creativity after feedback sessions. Significant changes were not found in the no-feedback condition.

TABLE 3

SIGN TEST ANALYSIS OF POSITIVE AND NEGATIVE CHANGES IN GROUP SCORES BETWEEN CASE SESSION ONE AND CASE SESSION TWO ON THE CREATIVITY-COMPROMISE INDEX

Groups	Sub-Groups	Creativity Compromise Indices		Positive Change	Negative Change	No Change	Sign Test Probability
		Case I	Case II				
Feed-back Groups	021	-2.25	1.5	8	2	2	.055*
	041	0.0	0.0				
	051	0.0	-0.5				
	071	-1.06	7.25				
	081	-7.5	0.0				
	091	-1.0	1.75				
	011	-0.5	0.0				
	031	1.5	1.75				
	061	0.0	0.0				
	101	-1.75	0.0				
	111	2.50	2.25				
	121	-3.75	0.25				
No-Feed-back Groups	022	1.25	0.0	7	2	3	.090
	042	-2.33	0.0				
	052	0.0	3.0				
	072	-9.5	-3.5				
	082	0.0	2.5				
	092	0.0	0.0				
	012	0.0	0.0				
	032	0.0	0.0				
	062	0.0	-0.75				
	102	0.0	2.25				
	112	-2.5	0.0				
	122	-7.56	2.75				

*Significant to the .055 level.

Hypothesis V. Group member affective reactions to work-emotionality behaviors in the delivery channel of communication, quantified and given to all other group members as feedback in the information channel of communication, will result in analysis of problem-solving subject matter in the information channel of communication during future group problem solving which is characterized by: greater improvement in the utilization of group resources for problem solution by the experimental group than by a control group.

Findings. Analysis of the Utilization of Resources Index is shown in Table 4. When positive, the Index indicates that the group product was more correct than the average individual product of the group members. Thus, group resources were used to advantage. When negative, the Index shows the group product to be less correct than the average individual outcome. Such cases show group resources to be inadequately used.

Computer and experimenter feedback groups were combined, as were computer and experimenter no-feedback groups, to gain two samples of twelve. A sign test was used to test Index changes. Feedback groups showed significant movement in a positive direction in the Utilization of Resources Index after feedback. After feedback, groups tended to improve in their use of group member resources. Significant changes were not found in the no-feedback condition.

TABLE 4

SIGN TEST ANALYSIS OF POSITIVE AND NEGATIVE CHANGES IN GROUP SCORES BETWEEN CASE SESSION ONE AND CASE SESSION TWO ON THE UTILIZATION OF RESOURCES INDEX

Groups	Sub-Group	Utilization of Resources Indices		Positive Change	Negative Change	No Change	Sign Test Probability
		Case I.	Case II				
Feed-back Groups	021	-6.5	2.0	10	1	1	.006*
	041	-1.0	0.5				
	051	-0.5	2.0				
	071	-3.0	6.5				
	081	-8.5	4.5				
	091	-0.5	3.0				
	011	-1.0	5.5				
	031	2.5	3.0				
	061	-0.5	-2.5				
	101	-1.5	-1.5				
	111	2.0	4.5				
	121	-5.0	-1.0				
No-Feed-back Groups	022	-1.0	2.5	8	3	1	.113
	042	-1.33	0.67				
	052	2.0	-3.0				
	072	-8.0	-3.5				
	082	0.5	0.5				
	092	-5.5	-5.33				
	012	-0.5	3.0				
	032	2.0	-8.0				
	062	0.0	-2.0				
	102	3.0	4.5				
	112	-4.5	-3.0				
	122	3.5	5.5				

*Significant beyond the .01 level.

Hypothesis VI. Group member affective reactions to work-emotionality behaviors in the delivery channel of communication, quantified and given to all other group members as feedback data in the information channel of communication, will result in analysis of problem-solving subject matter in the information channel of communication during future group problem solving which is characterized by: a greater increase in the number of perceived solutions to problems by experimental group members than by control group members.

Findings. Scale two of the Shaw Task Dimension Scale measured member perceptions of the number of solutions to group problems. A sign test, as shown in Table 5, was used to test changes in member perceptions of solution multiplicity.

Computer-assisted feedback groups and hand-tabulated feedback groups showed significant positive changes in the number of alternative solutions that members perceived to successive case studies. There was an increased number of perceived solutions to group problems within feedback groups not found in no-feedback conditions. The increase existed whether feedback was supplied through computer typewriters or by experimenter.

TABLE 5

SIGN TEST ANALYSIS OF POSITIVE AND NEGATIVE CHANGES IN MEMBERS' SCORES BETWEEN CASE SESSION ONE AND CASE SESSION TWO ON THE NUMBER OF SOLUTIONS SCALE OF THE SHAW TASK DIMENSION SCALE INSTRUMENT

Subjects	Positive Change	Negative Change	No Change	Sign Test Probability
Computer-Assisted Feedback Subjects	12	3	9	.018*
Computer-Assisted No-Feedback Subjects	7	4	11	.274
Experimenter-Assisted Feedback Subjects	12	4	8	.038*
Experimenter-Assisted No-Feedback Subjects	4	4	14	.637

*Significant to the .05 level.

Hypothesis VIII. Group member affective reactions to work-emotionality behaviors in the delivery channel of communication, quantified and given to all other group members as feedback data in the information channel of communication, will result in analysis of problem-solving subject matter in the information channel of communication during future problem solving which is characterized by: a greater increase in perceived cooperation in problem solving among experimental group members than among control group members.

Findings. Scale three of the Shaw Task Dimension Scale measured member perceptions of cooperation among group members in problem solving. A sign test was used, as shown in Table 6, to test changes in perceived cooperation between case sessions. Significant increases in perceived cooperation among group members were found only in computer-assisted feedback groups. Other groups did not demonstrate significant changes.

TABLE 6

SIGN TEST ANALYSIS OF POSITIVE AND NEGATIVE CHANGES IN MEMBERS' SCORES BETWEEN CASE SESSION ONE AND CASE SESSION TWO ON THE COOPERATION SCALE OF THE SHAW TASK DIMENSION SCALE INSTRUMENT

Subjects	Positive Change	Negative Change	No Change	Sign Test Probability
Computer-Assisted Feedback Subjects	11	3	10	.029*
Computer-Assisted No-Feedback Subjects	3	4	15	.500
Experimenter-Assisted Feedback Subjects	4	4	16	.637
Experimenter-Assisted No-Feedback Subjects	5	2	15	.227

*Significatn to the .05 level.

Hypothesis IX. Group member affective reactions to work-emotionality behaviors in the delivery channel of communication, quantified and given to all other group members as feedback data in the information channel of communication, will result in delivery channel activity during future group problem solving which is characterized by: a greater increase in interest in the subject matter of problem solving perceived by experimental group members than by control group members.

Findings. Scale six of the Shaw Task Dimension Scale measured perceived intrinsic interest with the assigned task among group members. A sign test, as shown in Table 7, was used to test changes in perceived interest between sessions. Significant increases in group member perceptions of interest were found only among the computer-assisted feedback groups. Other groups did not show significant change.

TABLE 7

SIGN TEST ANALYSIS OF POSITIVE AND NEGATIVE CHANGES IN MEMBERS' SCORES BETWEEN CASE SESSION ONE AND CASE SESSION TWO ON THE INTEREST SCALE OF THE SHAW TASK DIMENSION SCALE INSTRUMENT

Subjects	Positive Change	Negative Change	No Change	Sign Test Probability
Computer-Assisted Feedback Subjects	12	2	10	.006*
Computer-Assisted No-Feedback Subjects	7	5	10	.387
Experimenter-Assisted Feedback Subjects	6	6	9	.613
Experimenter-Assisted No-Feedback Subjects	11	5	6	.105

*Significant to the .05 level.

Hypothesis II. Group member affective reactions to work-emotionality behaviors in the delivery channel of communication, quantified and given to all other group members as feedback data in the information channel of communication, will result in analysis of problem-solving subject matter in the information channel of communication during future group problem solving which is characterized by: greater improvement in decision-making procedures leading to a group product perceived by the experimental group than by a control broup.

Findings. Table 8 summarizes the results of score changes in the Decision-Making Procedures Check List. A sign test was used to examine changes between case study sessions. Computer-feedback groups showed significant improvement between case study sessions in the type of decision-making procedures perceived by group members. No other significant changes were found.

TABLE 8

SIGN TEST ANALYSIS OF POSITIVE AND NEGATIVE CHANGES IN MEMBERS' SCORES BETWEEN CASE SESSION ONE AND CASE SESSION TWO OF THE DECISION MAKING PROCEDURES CHECK LIST INSTRUMENT

Subjects	Positive Change	Negative Change	No Change	Sign Test Probability
Computer-Assisted Feedback Subjects	12	2	10	.029*
Computer-Assisted No-Feedback Subjects	9	3	10	.073
Experimenter-Assisted Feedback Subjects	7	4	13	.274
Experimenter-Assisted No-Feedback Subjects	9	5	8	.212

*Significant to the .05 level.

Hypothesis VII. Group member affective reactions to work-emotionality behaviors in the delivery channel of communication, quantified and given to all other group members as feedback data in the information channel of communication, will result in analysis of problem-solving subject matter in the information channel of communication during future group problem solving which is characterized by: a greater decrease in perceived difficulty with the subject matter of problem solving by experimental group members than by control group members.

Findings. Scale one of the Shaw Task Dimension Scale measured perceived group member difficulty with the problem-solving task. A sign test, as shown in Table 9, was used to test changes in perceived difficulty between case study sessions. The hypothesis was falsified. However, results showed significant changes in the opposite direction from what was predicted. Subjects in both computer-assisted and hand-tabulated feedback groups perceived increased difficulty with case studies over the two problem-solving sessions.

TABLE 9

SIGN TEST ANALYSIS OF POSITIVE AND NEGATIVE CHANGES IN MEMBERS' SCORES BETWEEN CASE SESSION ONE AND CASE SESSION TWO ON THE DIFFICULTY SCALE OF THE SHAW TASK DIMENSION SCALE INSTRUMENT

Subjects	Positive Change	Negative Change	No Change	Sign Test Probability
Computer-Assisted Feedback Subjects	13	3	8	.011*
Computer-Assited No-Feedback Subjects	10	5	7	.151
Experimenter-Assisted Feedback Subjects	14	3	7	.006*
Experimenter-Assisted No-Feedback Subjects	11	8	3	.324

*Significant to the .05 level.

Hypothesis X. Group member affective reactions to work-emotionality behaviors in the delivery channel of communication, quantified and given to all other group members as feedback data in the information channel of communication, will result in delivery channel activity during future group problem solving which is characterized by: a shift in the experimental group toward a pairing basic assumption culture not found in a control group.

Findings. Table 10 summarizes the effects of changes in basic assumption culture over the two case study sessions. A sign test was used to test outcomes. The basic assumption culture is abbreviated for each case session. Seven symbols are employed to indicate culture:

I = Work Level One
III = Work Level Three
FI = Fight
FL = Flight
P = Pairing
D = Dependency
CD = Counter Dependency

The hypothesis of a shift toward a pairing culture was falsified. However, although changes in feedback groups were not in predicted directions, a trend was evident. Basic assumption culture showed a definite tendency to shift after feedback. No such trend occurred for no-feedback groups. There was thus a significant change in culture for feedback groups but not in the hypothesized direction. Nine of eleven groups shifted culture after feedback. Only two of twelve groups shifted culture in the no-feedback condition.

TABLE 10

SIGN TEST ANALYSIS OF POSITIVE AND NEGATIVE CHANGES IN GROUP BASIC ASSUMPTION CULTURE BETWEEN CASE SESSION ONE AND CASE SESSION TWO

Group	Sub-Group	Basic Assumption Culture		Positive Change	Negative Change	No Change	Sign Test Probability
		Case I	Case II				
Comp.-Assist. Feed-back Groups	021	III-FI	III-P/FI	2	2	1	.500**
	041	III-FI	III-P				
	051	III-P	III-FI				
	071	III-FI	III-P				
	081[1]		I-FL				
	091	III-P	III-P				
Comp.-Assist. No-Feed-back Groups	022	III-D	III-D	1	1	4	___*
	042	III-P	III-P				
	052	III-P	III-P				
	072	III-P	III-P				
	082	III-FI	III-FL				
	092	III-FI	III-D				
Exp.-Assist. Feed-back Groups	011	III-FI	III-P	2	3	1	.500**
	031	III-D	III-FI				
	061	III-FI	III-CD				
	101	III-FL	III-FI/P,				
	111	III-P	III-P				
	121	III-P	III-FI				
Exp.-Assist. No-Feed-back Groups	012	III-D	III-D	0	0	6	___*
	032	I-D	I-D				
	062	III-P	III-P				
	102	III-FI	III-FI				
	112	III-P	III-P				
	122	III-FI	III-FI				

[1]Session not tape recorded.

*Sample size too small to apply sign test.

**Probability after combining all twelve feedback or all twelve experimenter groups.

Table 11 applies a binomial test to these outcomes. Results show the tendency for feedback groups to shift basic assumption culture to be significant at the .033 level. The tendency for no-feedback groups to remain with the same culture over case sessions is significant at the .019 level.

TABLE 11

BINOMIAL TEST ANALYSIS OF CHANGE IN GROUP BASIC ASSUMPTION CULTURE BETWEEN CASE SESSION ONE AND CASE SESSION TWO

Groups	Cultures Shifted	Cultures Not Shifted	Binomial Probability
Feedback Groups	9	2	.033*
No-Feedback Groups	2	10	.019*

*Significant beyond the .05 level.

Hypothesis I A. Group member affective reactions to work-emotionality behaviors in the delivery channel of communication, quantified and given to all other group members as feedback data in the information channel of communication, will result in increased congruency between each group member's affective approach work-emotionality behaviors and the culture preference work-emotionality behaviors of other group members during future group problem solving as measured by: a greater increase in perceived satisfaction with expressed work-emotionality behaviors among experimental group members than among control group members.

Findings. All subjects in feedback groups -- experimenter-assisted and computer-assisted -- received information on how satisfied other group members were with their behavior. Satisfaction ratings were based on the Q Sort behaviors each group member most wanted to see in the instructional group. Subjective satisfaction ratings were combined with ratings showing the perceived amount of activity, and with ratings showing the direction in which the other member wanted future activity to move. Thus all subjects knew all other subject's ideal behaviors, how satisfied others were with their performance of those behaviors, how active others perceived them to be on those behaviors, and how others felt they should behave with regard to those behaviors in the future.

A sign test was used to test changes in satisfaction among experimental group members over the two case study sessions. Analysis is shown in Table 12. Figures in each cell represent ratings

of group members on all other group members. In each group, each member rated every other member on two behaviors during each problem-solving session. If there were four in a group, each member would give six ratings for each case session. A group of four would then have twenty-four ratings for each case problem. The 144 ratings for computer-assisted feedback groups represent six groups, each having twenty-four ratings per case session. Numbers of ratings vary for the four divisions of groups because some subjects failed to rate a Q Sort behavior or failed to do any rating during one of the case sessions. If subjects were absent, no-feedback groups were reduced to three. Thus, no-feedback groups show fewer total ratings. The same conditions are found in analysis of hypothesis IB.

Results indicated that all types of groups showed significant increases in satisfaction over the two case study sessions. Thus the satisfaction measure of the congruency hypothesis was falsified and did not differentiate among subjects.

TABLE 12

SIGN TEST ANALYSIS OF POSITIVE AND NEGATIVE CHANGES IN MEMBERS' SATISFACTION RATINGS BETWEEN CASE SESSION ONE AND CASE SESSION TWO ON THE SATISFACTION RATING SCALE

Subjects	Positive Change	Negative Change	No Change	Sign Test Probability
Computer-Assisted Feedback Subjects	130	14	0	Z = 9.58 p = .00*
Computer-Assisted No-Feedback Subjects	94	25	0	Z = 4.40 p = .00*
Experimenter-Assisted Feedback Subjects	115	23	0	Z = 7.75 p = .00*
Experimenter-Assisted No-Feedback Subjects	100	20	0	Z = 7.24 p = .00*

p = probability score
Z = standard score conversion (see Siegel, p. 72)
*significant beyond the .01 level

Hypothesis I B. Group member affective reactions to work-emotionality behaviors in the delivery channel of communication, quantified and given to all other group members as feedback data in the information channel of communication, will result in increased congruency between each group member's affective approach work-emotionality behaviors and the culture preference work-emotionality behaviors of other group members during future group problem solving as measured by: a greater change in work-emotionality activity perceived by experimental group members in directions indicated by group member feedback reports than by control group members.

Findings. As indicated in hypothesis I A, all feedback subjects received ratings from other subjects based on other subjects' Ideal Group Q Sorts. Ratings showed for each subject the amount of satisfaction, the amount of activity, and the direction of future activity desired by others.

A sign test was used to test response to the activity portion of the feedback ratings. Did activity of group members in fact shift in the directions indicated as desirable by the feedback? If a subject was told to change in a certain way and he in fact remained the same, or acted in the opposite direction, he was given a minus for the sign test. If a subject was told to change in a certain direction or stay the same, and he did so, he was given a plus for the sign test. Analysis is shown in Table 13.

The activity portion of the congruency hypothesis was falsified. However, significant results were found in the opposite

direction from what was predicted. Computer-assisted feedback and experimenter-assisted feedback groups showed significant changes in activity. Changes were in a negative direction. Subjects in feedback groups either changed in directions opposite to feedback instructions or remained at the same level of activity after receiving feedback directions to change. No significant shifts in activity were found in the no-feedback conditions.

TABLE 13

SIGN TEST ANALYSIS OF POSITIVE AND NEGATIVE CHANGES IN MEMBERS' ACTIVITY BETWEEN CASE SESSION ONE AND CASE SESSION TWO ON THE ACTIVITY RATING SCALE

Subjects	Positive Change	Negative Change	No Change	Sign Test Probability
Computer-Assisted Feedback Subjects	60	84	0	Z = 1.92 p = .0274*
Computer-Assisted No-Feedback Subjects	53	66	0	Z = 1.10 p = .1357
Experimenter-Assisted Feedback Subjects	53	85	0	Z = 2.64 p = .0041*
Experimenter-Assisted No-Feedback Subjects	55	65	0	Z = .82 p = .2601

p = probability
Z = standard score conversion (see Siegel, p. 72)
*significant beyond the .05 level

Hypothesis XI. Group member affective reactions to work-emotionality behaviors in the delivery channel of communication, quantified and given to all other group members as feedback data in the information channel of communication, will result in delivery channel activity during future group problem solving which is characterized by: a greater increase in feelings of cohesiveness perceived among experimental group members than among control group members.

Findings. Table 14 summarizes changes in Member Questionnaire total scores for all groups over the two case study sessions. A sign test was used to test these measures of perceived cohesiveness. The hypothesis was falsified. However, the computer no-feedback and the experimenter no-feedback conditions showed significant positive increases in members' perceptions of cohesiveness between the two case study sessions. Feedback conditons showed no significant change.

TABLE 14

SIGN TEST ANALYSIS OF POSITIVE AND NEGATIVE CHANGES IN MEMBERS' COHESIVENESS SCORES BETWEEN CASE SESSION ONE AND CASE SESSION TWO ON THE MEMBER QUESTIONNAIRE

Subjects	Positive Change	Negative Change	No Change	Sign Test Probability
Computer-Assisted Feedback Subjects	10	12	2	.416
Computer-Assisted No-Feedback Subjects	13	5	4	.048*
Experimenter-Assisted Feedback Subjects	10	8	6	.407
Experimenter-Assisted No-Feedback Subjects	15	4	3	.010*

*Significant to the .05 level.

Hypothesis IV. Group member affective reactions to work-emotionality behaviors in the delivery channel of communication, quantified and given to all other group members as feedback data in the information channel of communication, will result in analysis of problem-solving subject matter in the information channel of communication during future group problem solving which is characterized by: greater improvement in accuracy of group product by the experimental group than by a control group.

Findings. Change in group product accuracy was measured by change in the Group Decision Adequacy Index. The Group Decision Adequacy Index is a deviation score showing the degree to which a group rank ordering of a case study solution differs from the correct rank order as determined by faculty judges. The larger the Index, the less accurate is the group decision. The smaller the Index, the more accurate is the group decision.

Group Decision Adequacy Indices were calculated for all case study sessions. Change in Decision Adequacy Indices were tested with a sign test as shown in Table 15. No significant pattern of change for feedback and no-feedback groups was found between case study sessions. The hypothesis was falsified.

TABLE 15

SIGN TEST ANALYSIS OF POSITIVE AND NEGATIVE CHANGES IN GROUP DECISION ADEQUACY SCORES BETWEEN CASE SESSION ONE AND CASE SESSION TWO ON THE GROUP DECISION ADEQUACY INDEX

Groups	Sub-Group	Decision Adequacy Indices		Positive Change	Negative Change	No Change	Sign Test Probability
Feed-back Groups	02	161	16	5	6	1	.500
	04	141	8				
	05	81	16				
	07	161	14				
	08	261	8				
	09	61	10				
	01	161	10				
	03	181	8				
	06	81	20				
	10	121	22				
	11	101	4				
	12	161	20				
No-Feed-back Groups	02	182	8	4	8	0	.194
	04	142	8				
	05	62	16				
	07	242	10				
	08	82	16				
	09	182	14				
	01	122	16				
	03	62	22				
	06	182	12				
	10	142	8				
	11	182	16				
	12	142	4				

Post-experimental Data

Introduction

The Semantic Differential test provided information on post-experimental activity. Individuals scored the Differential twice during experimental sessions. A third administration of the instrument occurred on the last day of class, giving three measures of the subject "small group meetings" for all subjects. Hypothesis XIII predicted changes in meaning between the three administrations of the Differential. The hypothesis was falsified.

Other data were available on the long-term effects of experimental sessions on the remaining lives of all groups. Significant changes in scores on three tests were noted.

Post-experimental Hypothesis

Hypothesis XIII. Group member affective reactions to work-emotionality behaviors in the delivery channel of communication, quantified and given to all other group members as feedback data in the information channel of communication, will result in: a greater positive change in the dimensions of meaning of small group experience for experimental group members than for control group members.

Findings. Factor analysis of the Semantic Differential with trial terms similar to those used in this study revealed three factors. The factors were similar to those found by Osgood: an evaluative or attitudinal factor, a potency factor, and an activity factor. Semantic Differential scores on the concept "small group meetings"

were gathered for all subjects at three points in time: immediately prior to experimentation, immediately after experimentation, and on the last day of class. Changes in factor scores for subjects in the two experimental and the two countrol groups were tested with a sign test and results are shown in Table 16.

Change in factor scores was evaluated over three points in time. Change was analyzed between the pre-experimental and post-experimental administration of the test, between the pre-experimental and the last day of class administration of the test, and between the post-experimental and last day of class administration of the instrument. Sign test results show no significant changes in the predicted direction. The hypothesis was falsified. However, definite significant patterns of change did develop for the evaluative factor (factor I) in all four types of groups. Members of all groups showed a positive increase in factor scores between the pre-experimental and post-experimental administration of the Differential. Between the post-experimental and last day of class administration of the test there was a definite negative shift in factor scores. Such a pattern indicates an increase in evaluative or what Osgood refers to as "emotionally loaded" or attitudinal aspects of group experience during the experiment and a decrease in these aspects of group experience after experimentation.

The following scales, which had significant loadings on factor I after Varimax rotation, reflect the meaning of the factor for subjects:

9.	unsuccessful	-- successful
12.	incompetent	-- competent
14.	uncertain	-- confident
17.	unsteady	-- steady
19.	indecisive	-- decisive
23.	confused	-- clear
24.	indefinite	-- definite
25.	unsettled	-- settled
26.	undefined	-- defined

Results give added evidence to the conclusion that experimental intervention in these natural groups caused change in group member response patterns. Experimentation brought a positive change in all group members' attitudes toward small group experience which did not last during the post-experimental period.

TABLE 16

SIGN TEST ANALYSIS OF POSITIVE AND NEGATIVE CHANGES IN MEMBERS' FACTOR SCORES BETWEEN CASE SESSION ONE, CASE SESSION TWO, AND THE LAST DAY OF CLASS FOR ALL THREE FACTORS FROM THE SEMANTIC DIFFERENTIAL

Subjects		Factor 1			Factor 2			Factor 3		
		Case I & Case II	Case I & Last Day	Case II & Last Day	Case I & Case II	Case I & Last Day	Case II & Last Day	Case I & Case II	Case I & Last Day	Case II & Last Day
Computer-Assisted Feedback Subjects	+	19	11	5	13	10	8	13	12	12
	-	5	12	18	11	12	15	11	11	11
	p	.003*	.500	.005*	.419	.416	.105	.419	.500	.500
Computer-Assisted No-Feedback Subjects	+	20	14	6	9	6	9	14	9	9
	-	2	5	13	13	13	10	8	10	8
	p	.002*	.032*	.084*	.262	.084	.500	.143	.500	.500
Experimenter-Assisted Feedback Subjects	+	19	7	6	19	11	16	16	9	6
	-	5	12	12	5	8	8	8	10	13
	p	.003*	.180	.119	.003*	.324	.076	.076	.500	.084
Experimenter-Assisted No-Feedback Subjects	+	17	11	6	10	16	15	17	15	11
	-	5	9	14	12	4	5	5	5	9
	p	.008*	.412	.058	.416	.006*	.021*	.008*	.021*	.412

+positive change; -negative change; p-probability
*Significant to the calculated level.

Examining Long-Term Post-experimental Tests

Table 17 summarizes post-experimental results. Three tests -- the Shaw Task Dimension Scale, the Decision Making Procedures Check List, and the Leveling Scale -- were used by all groups during weekly meetings through the end of the semester. Responses helped to answer the question: Did affective feedback research sessions have long-term effects on the post-experimental life of ongoing groups? All three tests were evaluated by use of chi square in comparing pre-experimental with post-experimental scores for groups of eight. Scale categories in cells were combined when more than twenty percent of the categories on a scale had fewer than five responses.

Computer feedback and computer no-feedback groups showed a significant change in scales three and six of the Shaw Task Dimension Scale. Inspection of the expected minus the observed variations for all scale categories in each cell indicated that differences reflected a reduction in interest and a reduction in cooperation on tasks after experimentation.

Experimenter-assisted feedback and experimenter-assisted no-feedback groups showed a significant change on scale one of the Shaw Task Scale after the research sessions. The expected minus the observed variations revealed that the change primarily reflected a reduction in the perceived difficulty of future problem situations.

Analysis of Leveling Scale scores revealed significant changes in leveling for experimenter-assisted feedback and

experimenter-assisted no feedback groups. Inspection of the expected minus the observed variations revealed increased leveling among experimenter assisted group members in post-experimental sessions.

Changes in the Decision-Making Procedures Check List revealed significant differences in response distribtuions between pre-experimental and post-experimental data for all four groupings. Inspection of the expected minus the observed variations indicated an improvement in decision-making procedures by all groups between pre and post-experimental sessions.

TABLE 17

CHI SQUARE ANALYSIS OF MEMBERS' SCORES ON THE SHAW TASK DIMENSION SCALE, THE DECISION-MAKING PROCEDURES CHECK LIST, AND THE LEVELING SCALE FOR PRE-EXPERIMENTAL MEETINGS, AND OBSERVED SCORES FOR POST-EXPERIMENTAL MEETINGS

Test	Shaw Task Dimension Scale[1]				Decision-Making Procedures Check List[2]	Leveling Scale[2]
Scale	Difficulty	Number of Solutions	Cooperation	Interest	—	—
Computer Experience Subjects	1.24	4.86	9.85*	38.55**	21.85**	11.29
Experimenter Experience Subjects	11.92*	3.89	0.80	4.42	18.78*	46.73**

*Significant to the .05 level.
**Significant to the .01 level.

[1]Four degrees of freedom.
[2]Eight degrees of freedom.

Summary

Figure 9 presents a summary of outcomes for the thirteen hypotheses tested. Five symbols are employed in the figure:

1 - indicates hypothesis predictions which were not falsified, that is, results were in the direction predicted and significant at the .05 level or better

2 - indicates hypothesis predictions which were falsified, however, there were significant results at the .05 level or better for outcomes in the opposite direction from what was predicted

3 - indicates hypothesis predictions which were falsified, however, there were significant results at the .05 level or better for outcomes which showed a definite pattern of relationships not anticipated by the hypothesis

4 - indicates hypothesis predictions which were falsified and either had no significant pattern to outcomes or did not differentiate among groups

(1) - indicates that for analysis purposes the computer-assisted feedback and the experimenter-assisted feedback groups were combined as were the computer-assisted no-feedback and the experimenter-assisted no-feedback groups.

FIGURE 9

SUMMARY OF SIGNIFICANT FINDINGS

Hypothesis	Computer-Assisted Feedback Groups	Computer-Assisted No-Feedback Groups	Experimenter-Assisted Feedback Groups	Experimenter-Assisted No-Feedback Groups
IA	4	4	4	4
IB	2		2	
II	1			
III	1, (1)		1, (1)	
IV	4, (1)	4, (1)	4, (1)	4, (1)
V	1, (1)		1, (1)	
VI	1		1	
VII	2		2	
VIII	1			
IX	1			
X	3		3	
XI		1		1
XII	1		1	
XIII	3	3	3	3

CHAPTER V

SUMMARY AND DISCUSSION

Summary

The present research studied feedback theory conceptualized through a work-emotionality framework. Hypotheses predicted effects of affective feedback on the ongoing life of natural small problem-solving groups. The unique aspect of the research involved a comparison between computer supplied feedback, experimenter supplied feedback, and corresponding no-feedback control conditions. The study examined how feedback affected group processes and group outcomes and tried to discover if computer-assisted or experimenter-assisted modes of supplying feedback produced different results.

To implement the study, four types of four-man groups were designed. All groups worked on two case problems and filled out experimental instruments after each problem-solving session analyzing group activity. Between sessions groups received different feedback treatments. Subjects in computer-assisted feedback groups entered inter-member affective ratings into computer typewriters and received feedback through the machine. Members of experimenter-assisted feedback groups entered inter-member affective ratings onto pre-printed sheets and received feedback on similar sheets from an experimenter. Subjects in

computer-assisted no-feedback groups entered ratings into the computer and received no feedback. And members of experimenter-assisted no-feedback groups entered ratings on pre-printed sheets and received no feedback. Ratings were repeated by all group members after the second case session, but no group received feedback.

To gather data on group process and group outcome variables, the researcher used self-report instruments to analyze affective and content aspects of group problem solving. In addition, audio tape recordings were evaluated, and achievement, creativity, and resource utilization indices were computed from rankings of case study solutions.

Experimental sessions took place with ongoing natural groups. Pre-experimental and post-experimental measures of group behavior were included in the study.

Findings

Feedback Measurement and the Work-emotionality Framework

This study conceptualized feedback through a work-emotionality framework. Theoretical constructs were operationalized through use of Boyd's three channel model of communication. Affect was defined in work-emotionality terminology, and effects of affective feedback on information and delivery channel aspects of small group communication were examined. The specific effects of affective feedback on aspects of small group functioning were tested with thirteen hypotheses. Analyses of hypotheses compared the results of supplying affective feedback through the computer and through a human experimenter.

While the feedback supplied in this research was clearly in work-emotionality terminology, the purpose of the study was not to test work-emotionality theory itself. Work-emotionality theory did provide an excellent framework through which to view the feedback loop in small problem-solving groups. The highly operational nature of work-emotionality concepts allowed thorough research with feedback variables. Indeed, the ability to segregate and look simultaneously at work and affective components of behavior encouraged a detailed interactive model of the feedback loop. In addition, work-emotionality theory provided an integration of behavior on the individual and group levels permitting exploration of the full complexity of feedback effects on group functioning and on individual activity. Thus, work-emotionality theory provided a profitable perspective for examining educational effects of the feedback loop.

Particularly useful in the present research was the use of Boyd's model of communication as a paradigm for developing an experimental design for communication variables. The three communication channels of motivation, delivery style, and information were particularly powerful in conceptualizing the multi-dimensional and simultaneous aspects of communication within the feedback loop. Boyd's model provided for the application of affective feedback in work-emotionality terms.

Work-emotionality constructs in this study were a useful organizational framework in analyzing the affective feedback loop in small groups. Use of this framework has resulted in the specification of conditions which influence the successful use of feedback

in small groups. Specification of such conditions is the first step toward building a comprehensive theory of the feedback loop within groups.

Effects of Experimental Intervention

The first question around which data were organized was the effects of experimental intervention on the ongoing life of the small natural groups. Did experimental intervention change typical pre-experimental behavior patterns of group members? Six dimensions were used in evaluating intervention. Analysis examined whether experimentation brought changes in: perceived decision-making procedures used by groups, perceived openness in group member expressions of feelings, perceived difficulty with problem-solving tasks, perceived cooperation among group members, group member perceived interest in problem solving, and the number of solutions which members perceived to problems. Three self-report test instruments were employed which produced six data-gathering procedures in the evaluation of these six dimensions.

Intervention did change the behavior patterns in the small natural groups. Differences were found in all four kinds of groups and inspection of the statistical analyses showed changes to be positive. Small group members perceived increased openness in the expression of feelings, increased interest in problem solving, improved decision-making procedures, and increased cooperation during experimentation. Other significant differences existed within the outcomes of the data analysis. As reported in Chapter Four, no pattern appeared in these scattered significant results.

Data could not be organized so as to provide a single consistent interpretation.

An additional instrument added evidence of behavior change due to research sessions. The Semantic Differential was used to measure the meaning of the subject "small group experience" for all group members. Scores on factor I -- the emotionally loaded, evaluative or attitudinal factor -- showed a positive increase during experimentation and a decrease after experimental sessions. This indicates a temporary positive change in attitude toward small group experience as a result of experimentation.

Effects of Affective Feedback on Information Processing

A second pivotal question was the effect of affective feedback on information processing within groups. Did feedback affect information processing in the small, problem-solving, natural groups and were there differences due to the way feedback was supplied?

Seven aspects of information processing were analyzed: perceived decision-making procedures within groups, perceived group member difficulty with problem-solving tasks, number of alternative solutions to problems perceived by group members, group product, group creativity, and group utilization of member resrouces. Two self-report test instrument and a case ranking problem were used to produce six data-gathering procedures.

Feedback groups -- both computer and experiment-assisted -- showed significant improvements in creativity and utilization of group

resources not found in no-feedback groups. In addition, members of feedback groups perceived more solutions to future group problems and greater difficulty with future problems than members of no-feedback groups.

Computer-assisted feedback groups had perceptions of better improvement in cooperation and interest among group members than did experimenter-supplied feedback groups. Computer-assisted feedback also led to a perceived greater improvement in decision-making procedures used than experimenter-supplied feedback.

No significant differences were found between the two no-feedback groupings on measures of information processing over the two case sessions. And group product showed no significant change for all four groupings during experimentation.

Effects of Affective Feedback on Affective Behavior

A third question around which data were organized involved the effect of affective feedback on affective behavior within groups. Did feedback change affective behavior and were changes different between the four kinds of groups?

Five aspects of affective behavior were analyzed: perceived group member interest in problem solving, perceived member openness in the expression of feelings, perceived cohesiveness within groups, group basic assumption culture, and affective approach-culture preference congruency among group members.

Three self-report test instruments, two self-report rating scales, and an audio tape recording analysis produced six data-gathering procedures.

Feedback groups differed from no-feedback groups in reporting increased perceived openness in the expression of feelings after feedback and a change in basic assumption culture. While affective approach-culture preference congruency did not increase, work-emotionality activity changed in directions opposite to feedback instructions, that is, in directions leading to increased incongruency. Change in work-emotionality activity was found for feedback groups only.

No-feedback groups showed significant increases in perceived cohesiveness not found in groups receiving feedback.

Computer-assisted feedback groups differed from experimenter-assisted feedback groups in that members perceived increased interest with future problem solving. No significant differences were found between the two no-feedback groupings on measures of affective behavior between case sessions one and two.

Satisfaction, as part of the congruency measure, showed positive increases for all groups. It did not successfully differentiate between groups during experimentation.

Long-term Effects

Data were also available to explore long-term effects of research conditions on group behavior. Did research sessions have any lasting effects on group activity after experimentation and were their long-term differences among the kinds of groups examined?

Nine aspects of long-term behavior were explored: perceived decision-making procedures used by groups, perceived openness in the expression of feelings by group members, perceived difficulty with

group tasks, perceived cooperation among group members, perceived interest in future problem-solving tasks, number of solutions perceived by members to group problems, and the meaning of the subject "small group experience." Four self-report test instruments were employed producing seven data gathering procedures.

Subjects met in groups of eight after experimentation, and long-term changes in group behavior in computer-assisted and experimenter-assisted groupings of subjects were measured. Groups receiving computer assistance -- both feedback and no feedback -- showed significant decreases in perceived cooperation among group members and in perceived interest in problem solving after experimental sessions. Groups receiving experimenter assistance -- both feedback and no-feedback -- showed a significant decrease in perceived difficulty with future problems after experimentation and an increase among group members in the perceived open expression of feelings.

All four kinds of groups showed a positive increase in scores on the first or attitudinal factor of meaning for the Semantic Differntial from the beginning to the end of the experimental sessions. Factor scores decreased between the end of experimentation and the last day of class. All groups also showed significant improvement in perceived decision-making procedures used after experimentation when compared with pre-experimental sessions. Other long-term results were not significant.

Discussion and Interpretation

Experimental Intervention

In this research, experimental intervention, which supplied affective feedback to ongoing groups, changed perceived group member behavior patterns. Members of all groups -- experimental and control -- perceived different behavior during experimentation than during regular weekly group meetings.

Hall and Williams[1] take the position that decision-making procedures in established groups differ from procedures used in *ad hoc* groups. Gibb[2] has concluded that affective feedback to *ad hoc* groups does more to improve problem-solving efficiency and reduce defensiveness than does affective feedback to established groups. While Hall and Williams, and Gibb, recognized distinctions between experimentation with *ad hoc* groups and ongoing groups, they did not study intervention directly.

This research adds to the literature by examining ways in which ongoing perceived group member behavior tends to change during experimental feedback intervention. For some time, the Hawthorne effect has been recognized in social science literature. Numerous studies have found that putting subjects into an experiment influences research outcomes. In this study, a method was developed for appreciating the Hawthorne effect and taking it into account. All groups in this research -- experimental and control -- were placed within

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[1]Hall and Williams, pp. 214-22.

[2]Gibb.

the effect, and subjects were exposed equally to the influence of of experimentation. This allowed measurement of specific hypotheses across all experimental and control treatments.

In this study, experimental intervention brought positive change in all four kinds of groups on four measures. Intervention resulted in an increase in the perceived open expression of feelings among group members, an increase in perceived group member interest in task, an increase in perceived cooperation among group members, and improvement in perceived decision-making procedures used by groups, when compared to pre-experimental sessions. In addition, member attitudes toward small group experience improved during experimentation and decreased after research sessions.

Members of computer-assisted feedback groups, experimenter-assisted feedback groups, and computer-assisted no-feedback groups perceived both significant increased difficulty in problem solving and a significant increase in the number of solutions to problems, when compared to pre-experimental sessions. Computer-assisted no-feedback groups showed no similar increases on these two measures.

Information Processing

Problem-solving groups in this research, after receiving affective feedback, showed improvement in several areas of information processing but not necessarily in group product. Affective feedback led to improved creativity, improved use of group member resources, and perceptions by group members of a wider range of solutions to new problems. New problems, however, were perceived

as more difficult after affective feedback. These changes were not found in no-feedback control groups.

The works of Shaw and Blum[1] and Shaw and Caron[2] have shown group product to improve as a result of affective feedback. In addition Tolela,[3] and Wood and Goldberg[4] have indicated that with affective feedback comes improved group product.

As discussed below under affective behavior, feedback produced an increased openness in perceived group member expressions of feelings about the task. This openness apparently affected information processing within groups. Increased perceived openness resulted in members expressing a greater variety of solutions to task problems. More perceived solutions, when combined with openness, apparently led to improved creativity in group product and improved utilization of group resources after feedback.

Affective feedback, however, in addition to bringing increased openness, led members to a broadened consideration of group functioning. After feedback, in addition to task content, group members considered affective or social-emotional relationships within the group. This incorporation of the social-emotional dimension along with the task, led to perceptions of increased difficulty with future problems. Consideration of task and affective

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[1]Shaw and Blum, pp. 151-54.

[2]Shaw and Caron, pp. 299-300.

[3]Tolela.

[4]Wood and Goldberg, pp. 238-45.

components of group functioning, and the ensuing increased difficulty with task, resulted in no significant improvement in group product between case sessions.

Affective Behavior

In this research, affective feedback changed affective behavior within groups. Group basic assumption cultures shifted after feedback. However, in spite of increased perceived openness in the expression of feelings, work-emotionality behaviors tended to shift in directions opposite to feedback instructions. In addition, feedback produced no change in perceived cohesiveness within feedback groups. Cohesiveness did increase in no-feedback groups.

Myers *et al*[1] have concluded that affective feedback to group members makes subjects increasingly sensitive to interpersonal phenomena within the group. More specifically, Stoller[2] and Bradford[3] have taken the position that affective and task feedback to group members leads to expressive activity which is increasingly reflective of inner intentions. Lippitt[4] has concluded that specific behavioral feedback to group members produces change in directions indicated by that feedback.

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[1]Myers, *et al*., pp. 178-45.

[2]Stoller, p. 12.

[3]Bradford.

[4]Lippitt, p. 429.

In concurring with Myers' findings, subjects in this research became more sensitive to group interpersonal activity after feedback. However, behavior changed in directions opposite to feedback instructions, thus disagreeing with the findings of Stoller, Bradford, and Lippitt. It is noted, however, that these researchers either supplied feedback over a series of sessions, or held extended or multiple meetings after feedback.

In this study, affective feedback was supplied only once -- after an initial problem-solving case session. Measures of feedback effects were taken immediately after a ten-minute discussion session and a second thirty-minute case study. And, though subjects knew the type of change and the direction of change indicated in feedback reports, they did not execute that change during the second thirty-minute session.

It appears that the highly personal information contained in the feedback reports was a new, unexplored area for group discussion. The impact of seeing other members' reactions to one's behavior apparently overwhelmed subjects. As a result, group members seemed unable to fully incorporate feedback data into group functioning during the second case study.

However, during the second case session subjects did perceive increased openness in the expression of feelings toward the task, and did attempt to change affective work-emotionality behavior. But, since feedback reports had not been fully incorporated into group functioning, behavior changed in directions opposite to feedback instructions.

Apparently, other research has found change in behavior in directions indicated by feedback due to considerations of time. Other studies provided for the full incorporation of feedback data into group activity. By supplying feedback over a series of sessions or by holding extended or multiple meetings after feedback, other groups had sufficient time to fully assimilate feedback data into the life of the group. After assimilation of feedback information, members seemed able to change in directions indicated by feedback reports.

Gibb,[1] in supplying task and affective feedback to groups, has concluded that feedback reduces defensiveness, or more broadly interpreted, improves the open expression of feelings among group members. Shelley[2] takes the position that task result feedback improves group member feelings of group unity or cohesiveness.

While Gibb supplied task and affective feedback, this research supplied affective feedback only and found a similar outcome -- increased openness. Shelley supplied task result feedback over a series of meetings and found increased cohesiveness, while the present research supplied affective feedback only once and found no increase in perceived cohesiveness. Therefore, this study agrees with previous findings on increased expression of feelings after feedback. It disagrees with other results in finding that

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[1]Gibb.

[2]Shelley.

affective feedback does not increase cohesiveness. In fact, there was significant increased cohesiveness in the no-feedback condition.

It appears that two factors combined within feedback groups to detract from the formation of cohesive bonds. Members were apparently unable to assimilate the large amounts of private data contained within feedback reports. At the same time, subjects perceived increased openness in the expression of feelings about task after feedback. Simultaneous attempts by group members to deal with task and affective considerations, combined with increased perceived openness in expression of feelings, apparently led members away from the formation of inter-member cohesiveness. Subjects in no-feedback groups, not having to consider dual aspects of affect and task and having no significant increase in perceived openness, developed cohesive ties between case sessions.

Slater[1] has postulated an evolutionary model for change in group basic assumption culture. He takes the position that groups evolve over group life from fight-flight, through dependency, and into pairing cultures. While Slater's conception is essentially a long-term view, it was felt that evidence of such a transition would be noticeable after feedback. Slater's position was assumed and tested.

In disagreeing with Slater, Thelen[2] postulates that change in basic assumption culture cannot be predicted outside of a specific

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[1]Slater.

[2]Stock and Thelen, p. 190.

group context. To Thelen, culture change is dependent on group members and on conditions within specific groups.

Outcomes of this study furthered Thelen's position, particularly for a short time span. While feedback produced definite change in group basic assumption culture, change was not in the direction indicated by Slater. No discernable pattern of change could be found. This outcome points toward Thelen's conclusion that specific group characteristics determine the direction of basic assumption culture change within a group.

Computer Supplied Feedback

In this study, feedback supplied by computers led to immediate, short-term outcomes not found in either the experimenter-assisted feedback groups or in the two control conditions. Groups receiving computer-assisted feedback showed immediate improved perceived cooperation among group members, increased perceived interest by group members in future problem solving, and improved perceived decision-making procedures within the group.

In an extensive search of the literature, no studies were found on the effects of computer-assisted affective feedback to groups. Thus, there is no literature with which to compare experimental findings.

It can only be concluded that with affective feedback as defined in this research, the mode of supplying that feedback leads to immediate, short-term, improved, group member perceptions of cooperation, interest, and decision-making procedures within the group.

It is difficult to determine the reason for these immediate, short-term effects. It does seem reasonable to speculate that computer feedback results were due to the unique effects of feedback interaction between the subjects and the computer apparatus. Two factors, rapidity of machine feedback and machine involvement, may have accounted for the unique computer feedback findings. Feedback reports, when supplied by computer, were returned to subjects within five seconds after completion of member ratings. On the other hand, experimenter-assisted feedback reports took approximately ten minutes for compilation and distribution. Immediate feedback obviously helped to maintain subject interest and to bring minimum damage to the ongoing nature of the evening's activities. In addition, subjects receiving feedback became quite involved with the machine during feedback transmission. A considerable amount of noise, and rapid printing of the data, enthralled subjects during feedback return. Group members payed close attention to the process and quite often gave excited reactions to the machine activity during feeback discussion sessions. These two factors may have accounted for the unique computer-assisted feedback results.

Some of these findings are supported by work in the area of attention.[1] Attention is generally associated with interest: high levels of attention tend to coincide with high levels of interest. Rapid feedback and concurrent student involvement with the computer

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[1]D. J. Mostofsky, ed., "The Concept of Attention in Education," Journal of Education, CL (February, 1968), 3-91.

feedback process, resulted in observable high attention levels among computer-assisted feedback subjects. Observed high levels of attention were confirmed by increasing perceived interest scores. Similar levels of attention and interest were not found in delayed, experimenter feedback groups or in either kind of control group.

Long-term Effects

Several long-term effects of experimental sessions emerged in this study. Subjects in all four treatments perceived improved decision-making within their groups during long-term (one month) post-experimental weekly meetings. During research sessions, group members moved from individual to group solutions in analyzing case studies. It appears that the resulting personal investment in the group product focused member attention on decision-making procedures within the group. This increased awareness apparently carried over into post-experimental meetings when compared with pre-experimental sessions.

Negative long-term effects were found in groups having a computer experience -- both feedback and no-feedback. These groups showed a decrease in perceived cooperation among group members and a decrease in perceived interest in problem solving during post-experimental sessions, when compared with pre-experimental sessions. Thus, while computers may bring immediate short-term improvements to groups in the form of machine effects, results seem to indicate that, in the long-run, machine intervention may result in negative effects on group functioning.

Positive long-term effects were found in groups having an experimenter experience -- both feedback and no-feedback. These groups showed a decrease in perceived difficulty with problems during post-experimental sessions, when compared with pre-experimental sessions. There was also an increase in the perceived open expression of feelings among experimenter experience group members. Thus, results seem to indicate that, in the long-run, human intervention may have beneficial effects on group functioning. As explained in Chapter Two, inferences concerning long-term effects were not made from findings in the literature.

Summary

In this research, subjects placed into an experimental environment showed changes in response patterns when compared to pre-experimental meetings. This Hawthorne effect was taken into account by exposing all subjects equally to the influence of experimentation.

Affective feedback had an immediate influence on group functioning. Subjects receiving feedback perceived within their group increased openness in the expression of feelings about group tasks. Increased perceived openness resulted in the expression of more varied solutions to group problems. Therefore after feedback, subjects found a problem-solving environment in which members were increasingly open and developed a larger number of solutions to group problems. Working in such a climate, group

members became increasingly creative in their problem solutions and showed improved use of the resources within the group.

In addition to these findings, affective feedback brought other changes. Feedback reports included prescriptions for future affective behavior for each group member. Therefore in sessions after feedback, group members found themselves focusing on two aspects of group functioning - task and affective behavior. This double emphasis, incorporating the social-emotional dimension along with the task, resulted in future problems appearing more difficult to subjects. Due to this increased perceived difficulty, final group product did not improve between experimental case sessions.

Additionally, because of the short time between receiving feedback reports and the completion of the second case session, subjects found themselves unable to fully integrate the behavior prescriptions of the feedback into their group functioning. Nevertheless, behavior change was attempted, but change by group members occurred in directions opposite to feedback instructions. In addtion, emphasis on both task and social-emotional dimensions of group activity, combined with increased perceived openness, resulted in cohesive bonds not forming among feedback group members. Subjects in no-feedback groups in which these problems did not exist did develop cohesive ties between case sessions.

The literature indicates that if sufficient time is given to group members, feedback will be integrated into group functioning, and members will change behavior in directions indicated by

feedback instructions. Sufficient time for such integration was not provided in this research.

Findings indicate that the computer has immediate, short-term, beneficial, machine effects on computer-assisted feedback groups. Subjects receiving computer-assisted feedback showed an increase in perceived interest, improved perceived cooperation among group members, and improved perceived decision-making procedures in immediate future problem-solving sessions. These results seemed due to two factors in the computer-assisted feedback environment. Rapidity of feedback and machine involvement during feedback return appeared to stimulate group members and bring on the unique computer feedback effects. These effects were apparently short-term in nature and were not detected in analysis of long-term outcomes.

In the long-run, all groups showed improvements in decision-making procedures after experimentation in comparison to pre-experimental meetings. Improvements appeared due to the nature of the problem-solving task during research intervention. The research sessions emphasized a personal investment in the group solution to case studies, and thus focused subjects' attention on group problem-solving procedures. Apparently, this focus on problem-solving procedures maintained itself during future weekly meetings.

In the long-run, groups receiving computer experience showed a decrease in perceived cooperation among group members and a decrease in perceived interest in problem solving during

post-experimental sessions, when compared with pre-experimental sessions. This indicates that while computers may have immediate, beneficial, short-term, machine effects, in the long-run, machine intervention may result in negative effects on group functioning.

Additionally, experimenter experience groups showed a long-term increase in the perceived open expression of feelings and a decrease in perceived difficulty with future problem-solving tasks. Thus, in the long-run, human intervention may result in beneficial effects on small group functioning.

Implications

This study has been directed toward a preliminary assessment of the educational potential of the computer for supplying affective feedback to small, instructional, problem-solving groups. The research has directed itself to the central questions: Can the computer successfully supply affective feedback to small groups? And, are there advantages in using the computer as a feedback tool in small group instruction?

Results of the study point to the clear conclusion that affective feedback has a powerful influence on the educational outcomes of small group functioning. This conclusion takes into account the central weakness of this research: failure to allow for the full integration of affective feedback into group functioning before measuring educational outcomes. In spite of this weakness, affective feedback produced major changes in information processing and affective behavior within small groups. It follows

from these results that affective feedback is a useful instructional tool for changing group member behavior in desirable directions. Further study of affective feedback within instructional groups would seem profitable to education.

Granting these conclusions, the major questions still remain: Can affective feedback be successfully supplied to groups through computer apparatus? And, are there unique advantages to computer-supplied affective feedback which justify its use in instruction?

These questions cannot be answered unequivocally. The advantages to computer-assisted feedback which emerged from this research appeared to be short-term, immediate benefits attributable largely to machine effects. Indications were that short-term advantages were not maintained in the long-run. However, long-term measures were analyzed not from four-man experimental groups but from reconstituted groups of eight. Inclusion of computer no-feedback groups with feedback groups may have contaminated post-experimental findings, causing computer feedback differences to not be detected.

There were additional outcomes with subjects receiving a computer experience. Long-term results showed computer experience subjects having long-term decreases in perceived interest and cooperation during problem solving. The standard interpretation would be to analyze these outcomes as disadvantages brought on by machine intervention. However, though a negative conclusion is indicated, an alternative interpretation is possible. Having been exposed to highly stimulating computer facilities, during research sessions, computer experience group members may have found the future group

environment barren by comparison, thus bringing on the observed decreases.

While a literal interpretation of the data leads to a negative conclusion for computer use in small groups, further research is needed. Several problems are open to investigation. Are immediate beneficial effects of the computer on group functioning in fact machine effects and only short-term in nature? And, what are the long-term results of machine intervention into the ongoing life of small instructional groups? Additional projects will have to thoroughly explore these questions.

In considering the other groups in this study, major long-term effects of experimenter intervention into ongoing small group life were found to be positive. Increased openness in perceived expressions of feelings and decreased perceived difficulty with future problems indicate that human experimenter intervention into ongoing group life can bring beneficial outcomes. As with computer intervention, reasons for these long-term effects were not directly ascertainable with the groups and measures used in this research.

There are feedback conditions, however, not explored in this research, under which the computer would conceivably have definite advantages for supplying affective feedback to groups. Advantages center around rapidity of machine feedback. Outcomes of this study indicated that rapidity of feedback was a major factor contributing to short-term, positive, computer feedback results. Immediate feedback supplied by computer terminals brought

minimum intervention into the ongoing activity of experimental groups. Experimenter compiled feedback, on the other hand, required approximately ten minutes to supply and caused a noticeable break in the group's activity. This ten minute delay occurred, even though the feedback system used was relatively simple and direct. Obviously, as feedback systems become more complex, this immediate machine advantage will become more relevant as a long-term factor. Excessively long breaks in the ongoing activity of groups for experimenter feedback compilation would finally affect long-term educational outcomes. Therefore, use of complex feedback systems would seemingly make computer assistance desirable. Further research is needed to fully investigate this question.

In stressing educational product and process outcomes of small problem-solving groups in relation to computer-assisted affective feedback, this study did not consider other aspects of computer operation. However, two unexamined areas seem relevant to questions of the conditions under which computer-assisted affective feedback could be desirable.

One area is computer hardware design. The computer terminals used in this study were cumbersome and obtrusive in experimental groups. The specific hardware employed may have had effects on group functioning. Specific effects could only be measured by comparison of outcomes from this study with other studies using different types of hardware. As improved computer typewriters and advanced cathode display scopes become available for educational use, student terminals will become less obtrusive

and more acceptable for small group research. Improved terminals -- increasingly compact and providing more clear and involved information displays -- when combined with advanced complex feedback systems, might prove fruitful for supplying affective feedback to groups.

Another unexamined consideration is cost. At present, the high cost of computer facilities makes large scale applications of computers to group instruction largely impractical. Reductions in the cost of computer facilities, combined with improved computer equipment would make group applications of computers increasingly feasible.

The outcomes of this study indicate that affective feedback to groups is a desirable technique which can lead to beneficial educational outcomes. But, while computers can supply this feedback, a literal analysis of research findings indicates that computer terminals do not provide sufficient advantages over experimenter supplied feedback to be used immediately as a feedback tool. Closure on this question, however, is not possible from this preliminary study. Further research is needed to determine if unique computer feedback advantages are in fact only short-term in nature. In addition, study is needed to investigate the true nature of long-term results of experimenter and computer intervention into ongoing group life.

There do appear to be conditions, however, not investigated in this research, under which it could be desirable to use the computer as a feedback tool with groups. This study used a simple and direct

feedback system. Increasingly complex feedback systems may become too complicated for an experimenter to handle without causing a serious break in the ongoing activity of a small group. Under these conditions, use of computer facilities, cost and hardware permitting, would apparently be beneficial.

Basic Conditions for Feedback to Small Groups

From this research and from the literature, speculation is possible on the basic conditions which influence the successful use of feedback with small groups. The specification of such conditions, while being hypothetical and needing further investigation, is the first step toward developing a comprehensive theory of the feedback loop with small groups. Conditions which appear to influence the effectiveness of feedback to small groups are:

1. The Kind of Feedback Supplied. Affective and task result feedback are handled differently by small groups. The literature indicates that task result feedback is assimilated directly by a group and put to immediate use in group activity. However, affective feedback is not assimilated directly. Group members need time to incorporate affective feedback into group functioning and put it to use within the group. This difference indicates that task and affective feedback should be separately identified before being supplied to a small group.
2. The Content of the Feedback Supplied. Specific, negative, behavioral feedback is most successful in producing immediate, specific, behavioral change. However, positive, feeling-oriented, affective feedback is superior to other types of

affective and task result feedback in producing behavioral change among group members over longer periods of time.

3. Conflict within the Group. When there are moderate degrees of conflict within a group, members are most receptive to behavioral change through feedback. No conflict or intense conflict reduce the effectiveness of feedback to a group.

4. Outside Leader Intervention. Groups which develop without outside intervention are most responsive to behavioral change from feedback. Outside leader intervention by an instructor or externally appointed leader tends to reduce the effectiveness of feedback within groups.

5. Difficulty of Group Problem Solving. As difficulty of problems in group problem solving increases, members become more receptive to behavior change through feedback. In addition, after affective feedback equivalent problems appear more difficult to group members. Thus increasing problem difficulty, or supplying affective feedback with constant problem difficulty, will make group members more responsive to behavior change through feedback.

6. Rapidity of Feedback. Feedback which is supplied immediately after problem solving is most effective in influencing group behavior. Delayed feedback is less effective in influencing group activity.

7. Feedback Research Intervention into Ongoing Groups. Feedback research intervention into ongoing groups will change the pattern of perceived group member behavior. Subjects will perceive different inter-member behavior patterns during research than are typically perceived prior to or after experimentation.

8. Length of Group Life. Groups with an ongoing life will show long-term changes in perceived behavior patterns after feedback research intervention.

Implications for Further Research

In order to generalize the findings of this study, replications on different populations will be needed. In addition, there are the following direct possibilities for research:

1. Studies of affective feedback to groups using work-emotionality theory as an organizing theoretical framework for examining simultaneous task and affective components of feedback effects on groups would seem desirable.
2. Studies are needed of computer-assisted affective feedback to groups which take time consideration into account and allow for full integration of feedback reports into group functioning before measuring feedback effects.
3. Studies of computer-assisted affective feedback to groups are needed which fully examine effects of experimenter and machine intervention on long-term group functioning.
4. Studies of computer-assisted affective feedback to groups which analyze long-term machine effects by repeated computer-assisted feedback reports over time seem desirable.
5. Studies of computer-assisted affective feedback to groups are needed which examine increasingly complex feedback systems and the concurrent effects of immediate machine feedback versus delayed experimenter feedback on group functioning.

6. Studies examining the group use of computer-assisted instruction with different types of computer hardware, such as visual display cathode ray tubes, are necessary to fully investigate the potential of computer-assisted instruction with groups.
7. Research exploring the group applications of computer-assisted instruction in other areas, such as subject matter instruction, seems to warrant attention.

APPENDIX A

EXPLANATORY MATERIAL

Script of Instructions

Introduction

My name is Dick Hill and this is my wife, Donna. Donna will be helping us this evening. Tonight you will be doing two things. You will be working on two case studies and you will be filling out a series of instruments indicating your reactions to what is taking place.

The studies, although carefully refined with the Nursing School faculty, are experimental. You will be helping to further refine them for use with future nursing students. Your help is needed if we are to thoroughly perfect these cases. We believe you will find the studies challenging and useful in the sense that they will be identical to the kinds of problems you will encounter as future nurses. It is our hope that watching you work on these case studies will help to provide the most useful material to future nurses who take this course. To help us we will be tape recording the group discussion of the cases. In working on the studies we want you to bring your nursing expertise to bear on the problems that arise and we want you to reach a group solution.

First you will be working on a case study in small groups. Then you will be asked to fill out certain instruments concerning your learning experiences. You will be familiar with several of the instruments in that you will have worked on some of them in your group

meetings. Part of your experience will consist of working with an instrument stored in the computer.

(Tonight we have a problem in that the computer is down -- it is not working. Since this happens frequently with the machine we have prepared for this contingency so that you won't have to go home tonight and come back when it is working. We will do by hand what the computer is set up to do.)

Semantic Differential

I am going to have you fill out an instrument we call a semantic differential. You will have to fill this out in pencil. Does anyone need a pencil? First put your name on the answer sheet. The instructions are self-explanatory. This chart, explained in the instructions, should be helpful to you in working on your answers. The forms will be collected individually. Are there any questions?

Case Studies

I am now handing out to each of you a case study and a sheet of paper. Put your name on the paper. Read the instructions individually, read through the case study, and look at the eight alternative solutions. Individually decide on a ranking for the eight solutions from the one you think is best and should be done first to the one you think is least desirable and should be done last. Record your answers on the left hand side of the page.

Then as a group decide on a single group solution to the study. Write the words "group solution" on the right hand side of the page and each of you list the final group ranking on your answer sheets. You

will have thirty minutes to work on the study. Please identify yourselves verbally for the tape before beginning to work as a group. Are there any questions?

Member Questionnaire

I am now passing out to each of you a questionnaire. Fill in your name on the second line. As a reference point for this questionnaire think of the case study discussion you just had. Fill in the answers in terms of that discussion. Papers will be collected individually.

Shaw Task Dimension Scale

I am now handing out the Shaw Task Dimension Scale. Put your name on the answer sheet. You have filled out this instrument in your small group meetings before. We want you to use this instrument slightly differently tonight.

First as a group reach a group decision on the number of tasks you encountered in the previous case study. Decide as a group on names for each of those tasks. For example the group might feel that there were two tasks and call them "discussion" and "final decision." Each person would then enter these two names in column one of their answer sheet. Perhaps the group feels there was only one task, "group problem solution." In that case enter this name on line one of your answer sheets.

Each of you will then individually score the tasks according to the rating scales on page three of the instructions. Enter your

answers in the appropriate columns of your answer sheets. Papers will be collected individually. Are there any questions?

Decision Making Procedures Check List

I am now passing out the Decision Making Procedures Check List which you have filled out before in your small group meetings. Put your name on the answer sheet and individually enter the task numbers from the Shaw Scale in column one.

In the second column we want you to enter the decision procedures from the Check List which were used for each task. If more than one decision procedure was used for a task list first the procedure which was used most. List the next most used procedure second. Continue through all the procedures you felt were used for a given task. Are there any questions?

Leveling Scale

I am now passing out the Leveling Scale, another instrument you have used in your small groups. On the same answer sheet used for your Decision Procedures Check List give a leveling score for each task you have listed. Answer sheets will be collected individually. Are there any questions?

Rating Scales

I am now handing out to you a rating scale. The scale has two dimensions, activity and satisfaction. You will each be rating other members of the group on two statements. For each statement you will pick a number from this matrix describing how you felt each member behaved in terms of that statement. These statements are from the

Ideal Group Q Sort and are the behaviors you most wanted to see in an ideal instructional group.

As an example of your scoring, one statement might be: "This group was very talkative in reaching its conclusions." You might feel (group member) was quite active in terms of this behavior and you were quite satisfied with her activity. You would therefore rate her sixty-six. (Group member) may have been inactive on this behavior. Since this is what you want to see in a group you would be dissatisfied with her behavior. She might therefore be rated twelve.

After you have selected a rating for a person you must decide if you want them to do more of the behavior in question, do less, or stay the same. At the bottom of the page you see three numbers. If you want a person to do more of a behavior in question add 100 to your score from the score matrix and enter the number after that person's name. If you want a person to do less of a behavior add 200 to the matrix score and put your answer opposite his name. If you want the person to do the same in terms of a behavior add 300 to his matrix score and put it after his name.

Assume that the behavior given is: "This group avoided irrelevant discussion in reaching its conclusions." Assume that you feel (group member) was active in sticking to the issues and avoided irrelevant discussion, you were quite satisfied with her activity, and you wanted her to stay the same. What rating would each of you give her? Assume that (group member) was largely inactive in avoiding irrelevant discussion, you were dissatisfied with her behavior, and you wanted her to do more to avoid meandering discussion. What rating

would you give her? Does everyone understand how they are to do the rating?

Feedback Discussion Sessions

You each have sheets which show how other people have rated you on behaviors they wanted to see in an ideal group. There are also descriptions of what they want to see you do in the future. For the next ten minutes I want you to discuss this feedback. Attempt to determine what you need in your small group to improve its ability as a problem solving group.

Conclusion

Please do not discuss this evening's activities with other members of the class or with friends. I will give you a summary of results at a future class meeting. Thank you for your cooperation and good night.

Operational Definitions of Work Level Categories[1]

Work refers to the consciously determined, deliberative, reality-bound, goal seeking aspects of a group's activity. It is behavior involving conscious efforts to achieve the group's goal or publically stated task. The following categories are used in coding work behaviors.

I (WL_1) One-level work.
Activity is personally-need oriented, with low participant involvement, disinterest and disregard for the group. Group interaction is blocked by preoccupation with individual expression of need. Activity is focused on individual expression of need. Activity is focused on individual ego needs.

II (WL_2) Two-level work.
Involvement is moderate, and procedural in nature. Activity is focused on instrumentalities and organization so as to maintain the group. The group concern is with how to proceed in its work rather than discussion of task.

III (WL_3) Three-level work.
Involvement is high, with members working as a group absorbed in the task rather than with personalities or methodological details. Activity tends to be recognized as active problem-solving where reality testing of ideas occurs. The group will move into new aspects of its task, after having reached agreement concerning a certain phase of its work.

IV (WL_4) Four-level work.
Involvement is very high, with a high degree of positive contributions, and commitment to work on task solution. The focus of activity

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[1]This system is a combination of Thelen's Behavioral Rating System and recent developments by Boyd, Watson, and Marin.

is on creative task solution, with many and varied alternative solutions. The group is willing to share observations and insights without fear, and there exists a sense of trust and willingness to explore embryonic ideas.

Operational Definitions of Emotionality Categories[2]

Emotionality refers to the nonpurposive aspects of a group's activity. It is behavior which is "instinctual" and not under conscious control. Emotionality behaviors are categorized along the following polarity continuums.

I. Fight-Flight

The group acts as if its purpose is to avoid something by fighting or running away from it, instead of trying to find ways to understand or resolve the issue.

A. Fight - expressions of hostility and aggression. It may include attacking, rebuking, punishing, blocking, dividing the group, warning, threatening, expressing hostile resistance, self-aggrandizing (at expense of others), scapegoating, ridiculing, etc.

B. Flight - expressions of avoidance of the problem or withdrawal from participation. It may include light-veined humor, jocularity, fantasy, over-intellectualization, over-generalization, statements out of context emotionally, inappropriateness, tension-releasing laughter, dealing with trivia, off the point comments, etc.

II. Dependency-Counter Dependency

Emotional behavior that deals with how people handle problems of leadership. Reactions to different kinds of situations involving authority.

A. Dependency - expression of reliance on some person or thing external to the membership. It may include appeals for support or direction from the leader, looking for leader approval, undue attention expressing reliance on out-side authorities, expressing reliance on structure,

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[2]This system is a combination of Bion's original definitions and recent developments by Thelen, Boyd, Watson, and Marin.

procedure, or tradition. It also may involve expressions of group weakness, fear of trying things, etc.

B. Counter-Dependency - expressions of concern over threat to personal autonomy resulting from reliance on one of a group of individuals for direction, upon subject matter, or upon a rigid methodology. It may include indications of individual attempts to assume direction of the group, displays of independence, insistance upon individual maturity and questioning of authority, concern with high status in the group, constant struggle against appearing to be forced into a dependency role, etc.

III. Pairing-Counter Pairing

Emotional states and behaviors have to do with affection, friendliness and warmth.

A. Pairing is usually identified with two people consistently agreeing on issues or supporting each other, and when more than two combine to support each other on the same issue. The group acts as if its purpose is to find strength within its own peer group. Behavior is exhibited in expressions of warmth, intimacy, and supportiveness. It may include expressions of supportiveness, friendliness, unusual responsiveness, side remarks to another, expressions of commendation, enthusiasm or warmth directed toward the group as a whole, etc.

B. Counter-Pairing is the opposite of pairing and identifies expressions of desire for formality, aloofness, interpersonal isolation, detachment. It may include resistance against casualness in groups, desire to preserve the group as a whole, disregard for close relationships with other group members, desire to keep personalities apart from group issues, unfriendliness with the group, impersonal tendency in comments, discomfort with the sharing aspects of intimacy, etc.

APPENDIX B

COPIES OF INSTRUMENTS

Ideal Group Q Sort

Instructions

Directions: (Please read all directions first).

Please distribute the cards into 11 piles, as shown below, according to how closely they describe what you want to see in your small discussion group.

1. First, arrange the brown envelopes in front of you, in order, with Envelope I on your left to Envelope XI on your right, as shown below.

2. Then distribute the cards according to their closeness to being "most like" or "least life" what you want to see in your small discussion group. Each envelope lists the number of cards you should place with it. Many people find it helpful to separate the cards into 3 piles first.

Envelope and pile number	Most Like I	II	III	IV	V	VI	VII	VIII	IX	X	Least Like XI
Number of Cards in pile	2	3	5	8	12	12	12	8	5	3	2

3. Finally, put the cards into the appropriate envelopes. For example, into Envelope I put the 2 cards which are "most like" your ideal group. Into Envelope II put the 3 cards which are next "most like" your ideal group, etc. Into Envelope VI you should put the 12 cards about which you have neutral feelings.

Please do not seal the envelopes.

Statements In The Ideal Group And

Perceived Group Q Sorts

Ideal Group Q Sort	Perceived Group Q Sort
1. I think a group should have active, directive leadership to help it advance from past experiences to new ideas.	This group had active directive leadership that helped us advance from past experiences to new ideas.
2. I think a group should support its leader and defend him from personal attacks.	This group supported our leader and defended him from personal attacks.
3. I think a group should avoid expressing negative or critical opinions of unique proposals.	This group avoided expressing negative or critical opinions of unique proposals.
4. I think a group should attempt to keep all members satisfied and willing to accept the dominant mood of the group.	This group attempted to keep all members satisfied and willing to accept the dominant mood of the group.
5. I think group members should remain silent rather than enter arguments that disrupt the flow of new ideas.	Members of this group remained silent rather than enter arguments that might have disrupted the flow of new ideas.
6. I think members should remind the group of the need for unity and warmth.	Members reminded the group of the need for unity and warmth.
7. I think a group should be so absorbed in problem-solving that it wastes no time on trivial social niceties.	This group was so absorbed in problem-solving that we wasted no time on trivial social niceties.
8. I think a group should take issue with members seeking traditional answers to problems or being skeptical of unusual ideas.	This group took issue with members seeking traditional answers to our problems or being skeptical of unusual ideas.

9. I think members should become so well acquainted that they feel free to offer wild, unheard of suggestions.	The members became so well acquainted that they felt free to offer wild, unheard of suggestions.
10. I think group leaders should have the major responsibility for planning group activities.	The leader of this group had major responsibility for planning group activities.
11. I think group members should disclose attitudes to the total group, not to selected individuals.	Members of this group disclosed attitudes to the total group, not to selected individuals.
12. I think a group leader should summarize progress before final decisions.	The leader of this group summarized progress before final decisions.
13. I think a group should discourage special friendships and advocate creativity as its primary function.	The group discouraged special friendships and advocated creativity as our primary function.
14. I think a group should be organized, to evade the uneasiness of group dis-	This group was organized, evading the uneasiness of group disharmony.
15. I think a group should rely more on each member's work experiences than upon books, for information.	The group relied more on each member's work experiences than upon books, for information.
16. I think a group should consider each member as important as the leader.	The group considered each member as important as the leader.
17. I think group members should conceal true feelings that might hinder deep concentration on accomplishing its goals.	Members of this group concealed true feelings that might have hindered deep concentration on accomplishing our goals.
18. I think a group should fight for many varied answers to its learning problems.	The group fought for many varied answers to our learning problems.

19. I think a group meeting should be conducted according to the writings of authorities on group discussion.	The group meeting was conducted according to the writings of authorities on group discussion.
20. I think group members should freely argue or take sides in arguments caused by individual outbursts.	Members of this group freely argued and took sides in arguments caused by individual outbursts.
21. I think a group should express any doubts it has about the leader's ability.	This group expressed doubts they had about the leader's ability.
22. I think a group should schedule definite breaks, to get away from work topics for a while.	The group scheduled definite breaks, to get away from work topics for a while.
23. I think group members should grow closer together as they examine their knowledge of a topic.	The group members grew closer together as they examined their knowledge of a topic.
24. I think a group should rely upon its leader to keep it on schedule.	This group relied upon our leader to keep us on schedule.
25. I think a group should stimulate original thinking by forming intimate sub-groups.	This group stimulated original thinking by forming intimate sub-groups.
26. I think a group should be informal and intimate in order to be creative.	This group was informal and intimate in order to be creative.
27. I think a group should often consider the value of its actions, without relying upon the leader.	This group often considered the value of our actions, without relying upon the leader.
28. I think group members should impulsively state even negative feelings to stimulate fresh thinking.	Members of this group impulsively stated even negative feelings which stimulated fresh thinking.
29. I think a group should be ready to argue about the implications of decisions it makes.	This group argued about implications of decisions we made.

30.	I think members should look to the group for advice, without embarrassment.	The members looked to the group for advice, without embarrassment.
31.	I think a group should maintain discussion on a person-to-person level to allow the stating of problems of individuals.	This group maintained discussion on a person-to-person level, allowing the stating of problems of individuals.
32.	I think a group should oppose unusually stubborn members.	This group opposed unusually stubborn members.
33.	I think a group should apply its energies producing exciting task innovations rather than forming social relationships.	This group applied our energies producing exciting task innovations rather than forming social relationships.
34.	I think group members should condemn sarcastic answers to useful, intelligent questions.	Group members condemned sarcastic answers to useful, intelligent questions.
35.	I think members should be against pairing off and should mention it to the group.	The members were against pairing off and mentioned it to the group.
36.	I think group members should learn to like each other early, while organizing their work.	The group members learned to like each other early, while organizing their work.
37.	I think a group should tolerate and excuse statements of members' anxieties.	This group tolerated and excused statements of members' anxieties.
38.	I think group members should discuss anxieties with members of their own choosing.	Members of this group discussed anxieties with members of their own choosing.
39.	I think a group should forcefully carry out plans for meetings, regardless of objections from some members.	The group forcefully carried out plans for meetings, regardless of objections from some members.
40.	I think a group should be openly critical of any members who try to prevent the planning of its work procedures.	This group was openly critical of any members who tried to prevent the planning of our work procedures.

41.	I think a group should make light of any ill feeling expressed, in order to pursue its problem most productively.	This group made light of ill feeling expressed, in order to pursue our problem most productively.
42.	I think a group should have a formal structure providing status opportunities for members other than leader.	This group had a formal structure providing status opportunities for members other than leader.
43.	I think a group should organize sub-groups that would allow each member to know some members very well.	This group organized sub-groups that allowed each member to know some members very well.
44.	I think a group should base its work on the unrestricted ideas of its membership, regardless of expert opinion.	The group based its work on the unrestricted ideas of its membership, regardless of expert opinion.
45.	I think a group should focus attention on all of its creative members, instead of the leader.	This group focused attention on all of our creative members, instead of the leader.
46.	I think a group should tend to follow the insightful suggestions of its most creative members.	This group tended to follow the insightful suggestions of our most creative members.
47.	I think members should leave a group if they can't mention their private concerns.	Members left the group when they couldn't mention their private concerns.
48.	I think a group should critically survey the objectives of its leader.	This group critically surveyed the objectives of our leader.
49.	I think a group should begin by outlining a system that would discourage cliques.	This group began by outlining a system that discouraged cliques.
50.	I think group members should be a formal team that will bypass guesses and past answers to problems.	The group members were a formal team that bypassed guesses and past answers to problems.
51.	I think a group should direct task content questions and suggestions to its leader.	This group directed task content questions and suggestions to our leader.

52.	I think a group should be critical of its work progress, in intellectual rather than personal terms.	This group was critical of our work progress, in intellectual rather than personal terms.
53.	I think group members should demand a chance to talk about individual grievances.	Group members demanded a chance to talk about individual grievances.
54.	I think a group should resist leaders who restrict expression of feelings.	This group resisted the leader for restricting expression of feelings.
55.	I think a group should strive for a friendly atmosphere by frequently determining understanding and accomplishment.	This group strove for a friendly atmosphere by frequently determining understanding and accomplishment.
56.	I think a group should withhold gestures of friendship so that each individual may indicate his attitudes towards the group.	This group withheld gestures of friendship so that each individual could indicate his attitudes towards the group.
57.	I think a group should carefully define its task before proceeding, to avoid arguments.	This group carefully defined our task before proceeding, avoiding arguments.
58.	I think a group should accept prolonged arguments, if necessary, in solving the important problems before moving to others.	This group accepted prolonged arguments, when necessary, in solving the important problems before moving to others.
59.	I think a group should have working rules that minimize the need for a leader.	The group had working rules that minimized the need for a leader.
60.	I think a group should be very businesslike in defining its work requirements.	The group was very businesslike in defining our work requirements.
61.	I think a group should define policies at the outset to avoid assigning authority to individuals.	This group defined policies at the outset, avoiding assigning authority to individuals.
62.	I think a group should develop procedural methods that enable cordial and comfortable relationships.	This group developed procedural methods that enabled cordial and comfortable relationships.

63. I think a group should stay away from harsh judgment of members' thought-provoking ideas.	The group stayed away from harsh judgment of members' thought-provoking ideas.
64. I think a group should seek new insights and be wary of any established answers offered by its leader.	This group sought new insights and was wary of any established answers offered by our leader.
65. I think a group should evaluate its decisions and accomplishments frequently in friendly discussion sessions.	This group evaluated our decisions and accomplishments frequently in friendly discussion sessions.
66. I think members should depend upon group action to blend past learning and present original thinking.	The members depended upon group action to blend past learning and present original thinking.
67. I think a group should change to another part of its task when members disagree.	The group changed to another part of our task when members disagreed.
68. I think a group leader should decide when to move the group to another part of its problems.	The group leader decided when to move the group to another part of our problem.
69. I think a group should first establish schedules and assign necessary duties to keep members from dividing along friendship lines.	This group first established schedules and assigned necessary duties, keeping members from dividing along friendship lines.
70. I think a group should consider it important to quickly satisfy individual complaints, avoiding unpleasantness.	This group considered it important to quickly satisfy individual complaints, avoiding unpleasantness.
71. I think group members should verbally attack anyone opposing establishment of a firm agenda.	Members of this group verbally attacked those opposing establishment of a firm agenda.
72. I think a group should discourage jokes and side comments so that important discussion will not be interrupted.	The group discouraged jokes and side comments so that important discussion would not be interrupted.

Semantic Differential

INSTRUCTIONS

On the two pages following these instructions you will find a group of words printed in bold-faced type and beneath them a set of scales. You are to rate your reactions to these words on each of the scales in order.

If you feel that your reactions to the words at the top of the page are VERY CLOSELY RELATED to one end or to the other of the scale, you should mark eitherthe 1 <u>or</u> the 7 on the answer sheet corresponding to your choice. If you feel that <u>fair</u> is MOST CLOSELY RELATED to the words, you would blacken in the 1 on your answer sheet.

1. fair	1	2	3	4	5	6	7	unfair
	:1:	:2:	:3:	:4:	:5:	:6:	:7:	

If you feel that <u>unfair</u> is MOST CLOSELY RELATED to the words, you would blacken in the 7 on the answer sheet.

1.	:1:	:2:	:3:	:4:	:5:	:6:	:7:

If you feel that your reactions to the words at the top of the page are QUITE CLOSELY RELATED to one end or to the other of the scale (but not extremely), you should mark either the 2 <u>or</u> the 6 on the answer sheet corresponding to your choice.

If the words are ONLY SLIGHTLY RELATED to one side or to the other side (but not equally related), you should mark either the 3 <u>or</u> the 5 on the answer sheet corresponding to your choice.

If the words are EQUALLY RELATED to either side of the scale, you should mark 4 on your answer sheet.

Work at fairly high speed through this instrument. Do not puzzle over individual items. Make each item a separate and independent judgment. It is your first impressions, the immediate feelings about the items, that is being requested. On the other hand, please do not be careless, otherwise it would be meaningless to take the instrument.

Repeating the words at the top of the page, to yourself, helps to speed you along on each item.

1.	silent	1	2	3	4	5	6	7	talkative
2.	practical	1	2	3	4	5	6	7	theoretical
3.	active	1	2	3	4	5	6	7	quiet
4.	competitive	1	2	3	4	5	6	7	cooperative
5.	defensive	1	2	3	4	5	6	7	assertive
6.	aggressive	1	2	3	4	5	6	7	retiring
7.	easy-going	1	2	3	4	5	6	7	ambitious
8.	skillful	1	2	3	4	5	6	7	awkward
9.	unsuccessful	1	2	3	4	5	6	7	successful
10.	adequate	1	2	3	4	5	6	7	inadequate
11.	industrious	1	2	3	4	5	6	7	procrastinating
12.	incompetent	1	2	3	4	5	6	7	competent
13.	open	1	2	3	4	5	6	7	closed
14.	uncertain	1	2	3	4	5	6	7	confident
15.	empty	1	2	3	4	5	6	7	full
16.	consistent	1	2	3	4	5	6	7	inconsistent

17.	unsteady	1	2	3	4	5	6	7	steady
18.	rigid	1	2	3	4	5	6	7	adaptable
19.	decisive	1	2	3	4	5	6	7	indecisive
20.	uncompromising	1	2	3	4	5	6	7	compromising
21.	disorderly	1	2	3	4	5	6	7	orderly
22.	relaxed	1	2	3	4	5	6	7	tight
23.	clear	1	2	3	4	5	6	7	confused
24.	indefinite	1	2	3	4	5	6	7	definite
25.	unsettled	1	2	3	4	5	6	7	settled
26.	defined	1	2	3	4	5	6	7	undefined
27.	shifting	1	2	3	4	5	6	7	stable
28.	warm	1	2	3	4	5	6	7	cool
29.	distant	1	2	3	4	5	6	7	intimate
30.	giving	1	2	3	4	5	6	7	withholding
31.	rejecting	1	2	3	4	5	6	7	accepting
32.	soft	1	2	3	4	5	6	7	hard

Case I

INSTRUCTIONS

Read the following case study. At the end of the study you will find eight alternatives for dealing with the problems which are presented. Your task is to work as a group and to reach a group consensus. Rank the eight alternatives from the one the group thinks is most desirable and should be done first to the one the group thinks is least desirable. You will have thirty minutes to read and analyze the study.

Until the age of 30 Nell lived what seemed to be a relatively normal life. She did find herself at times exhausted, but usually a few hours sleep would help her revive. Nell married young at 18 and by her 19th birthday had her only child, Ann. As the years went by Nell discovered that her periodic exhaustion was becoming a general weakness throughout her body. Rest became less and less of a solution. When she discovered a partial paralysis developing in her left leg and a short time later experienced her first tremors, she went to a physician. His diagnosis was multiple sclerosis - an incurable degenerative disease of the central nervous system. Within two years she had become an invalid. Since Nell's husband was a mill worker with limited income he turned to the local Public Health Nurse for help with his wife's invalidism.

Lynn was a nurse on the Public Health staff when the Supervisor of Nurses assigned her to Nell. The supervisor knew Lynn had first hand experience with multiple sclerosis and felt she could quite adequately handle the case. Lynn's mother had died from complications resulting from the disease five years ago. Lynn had spent most of her thirteenth through seventeenth years caring for her mother. Lynn knew well the problems of M. S.: the decubitis ulcers, the perineal rashes, the battle against metrorrhagia, dehydration, and bladder infection. But most indellibly impressed on Lynn's mind were memories of the effects of an incurable disease: the progression from full capactiy to complete invalidism.

As she received her assignment Lynn remembered vividly waking in the middle of the night to turn her mother. She could again smell the bedsores as she changed her mother's dressings, and she remembered her mother's mental anguish during physical and psychological deterioration. Lynn's final reaction to multiple sclerosis had become one of aversion, flight, fear and resentment against something over which she had no power and which had gradually destroyed her family life.

The supervisor described to Lynn Nell's problems in accepting her invalidism. Nell had become a "difficult person to get along with". She had become hostile and crabby with everyone. "Why did this have to happen to me?" and "What am I being punished for?" were two of her most frequent complaints.

Lynn's first visit with Nell was traumatic. All Lynn's old memories and fears returned to her. The smell of the bedsores, the sight of a deteriorated body, the reaction to the patient's feelings of hopelessness, overwhelmed Lynn and made her want to run from the scene. An attempt at help brought the response from Nell: "You have two legs and can walk, do it for me.". Lynn was afraid of Nell and also of herself.

Lynn has several alternatives. You are to work together as a group. Your task is to reach a group consensus on the rank order of the eight alternatives available to Lynn. First select the alternative the group believes to be the best. Then select the second best. Continue until all the alternatives have been ranked.

1. Recognizing that her own psychological problems and biases handicap her, Lynn should ask that someone with a more objective attitude be assigned to Nell.

2. Nell should be encouraged to take screwdrivers in moderation as a means of relieving physical pain and allaying anxiety and fear.

3. Nell should be placed in a hospital so she can receive proper treatment for her steadily increasing disability.

4. Nell should remain at home. She should be encouraged to be as autonomous as possible.

5. Lynn should look deeply into her own problems and resolve her own anxieties so that Nell can relate to her and use the help she offers.

6. Nell should be given positive psychological support. She should be bolstered with positive views of the present and future.

7. The facts of Nell's illness should be fully explained to Ann in hopes of having an adequate mother-child relationship.

8. Nell's husband should learn the skills of caring for a person who is moving from full capacity to complete invalidism.

After three visits Lynn began considering the need for placing Nell in a hospital in which she would qualify for free care. Nell seemed definitely opposed to this idea. In spite of her helplessness and her hostility she wanted to stay at home. She still felt that she was the hub of the household. She was the mother, the center of activity.

And in fact Nell's deterioration had not yet left her completely helpless. When her husband would help her into a wheel chair she could move around the house and even manage to cook her own meals on the stove. She had a degree of independence and autonomy and seemed convinced she could achieve still more. But along with this independence Nell had deep fears about being alone while her husband was at work and her daughter at school. She was afraid of an accident or an emergency. What could she do if she fell from her wheelchair or if she started a fire while cooking on the gas stove? These possibilities were constantly on Nell's mind and seemed somehow to increase her hostility and crabbiness with others.

Yet with all her problems Nell did have one pleasure which seemed to ease her whole condition. She was fond of drinking screwdrivers (vodka and orange juice). As time went on she turned more toward this release. Screwdrivers would ease her pain. They made her loose and spontaneous and gave her relief from both physical and mental suffering. However, there were after effects. Nell found that at times screwdrivers led to nausea, vomiting, and bowel disturbances and they seemed to sometimes leave her physically more weak.

Nell's husband had a hard time dealing with the disease. As time went on he seemed to grow more and more aloof from his wife. At first he had been able to take the constant care which she required. But gradually the need for awakening in the middle of the night to turn Nell, the problem of cleaning her messy bed, and the changing of her dressings grew heavy on him. His work at the mill became less productive and he continued to grow more distant.

Ann at age fourteen did her best to help her father and bore as much of the burden for her mother's care as possible. She would come directly home from school and help her mother from the wheelchair into bed. She would then change her mother's dressings and try to pick up the house before her father arrived home. In spite of herself Nell was sometimes curt with Ann's inexperience.

Ann had shifting feelings toward her mother. At first she felt bewilderment at her mother's condition. Now her reaction had changed to one of desperate fear. Lynn knew what Ann was experiencing. She could not help but recognize her own problems in Ann's reactions.

Case II

INSTRUCTIONS

Read the following case study. At the end of the study you will find eight alternatives for dealing with the problems which are presented. Your task is to work as a group and to reach a group consensus. Rank the eight alternatives from the one the group thinks is most desirable and should be done first to the one the group thinks is least desirable. You will have thirty minutes to read and analyze the study.

Rosita had been referred to the local County Health Department by a neighborhood social worker when she was four months pregnant. Her outpatient care was uneventful and at nine months she delivered a seven pound baby boy. The baby, like Rosita herself, was born blind. Medical records showed Rosita to be thirty-five years of age, unwed, and a primipara. She lived in a poor Spanish speaking section of Chicago and knew very little English. Fortunately the hospital employed a bi-lingual nurse who was able to be with Rosita during treatment and delivery.

As a public health nurse Jodi was given the postpartum care of Rosita and her child. Jodi spoke no Spanish but was eager to do her best. Jodi's initial trip to Rosita's house was with the neighborhood bi-lingual social worker.

Rosita lived alone with her fifty-two year old mother in a rather shabby tenement building. Her background showed a sparse education. At age six she had been enrolled in a State School for the Blind. She had completed a year and a half of instruction. At the end of this time her mother refused to let her continue. She lived at home until age twenty-one when the State Welfare Department insisted that to receive her monthly check she must enroll in the State's rehabilitation program for the handicapped. In five months of instruction she learned some of the rudiments of Braille and gained confidence in using her cane in strange places.

Rosita's mother and father had immigrated from Mexico before Rosita was born. Her father had died in an industrial accident when Rosita was thirteen. Since that time she had been completely in the care of her mother. Rosita had not developed any skills of her own. Her mother had always supported her with a job as a night time srubwoman in a local office building.

When Jodi and the social worker knocked at the door Rosita's mother let them in with broken English. The mother led the two into the bedroom and introduced them to Rosita and the child Miguel.

As the conversation progressed between the social worker, Rosita, and the mother -- almost entirely in Spanish -- it became obvious that Rosita's mother was dominating the interchange. The social worker translated freely to Jodi, and on occasion Rosita's mother addressed her in broken English. All questions addressed to Rosita were answered by her Mother. Rosita was obviously a withdrawn and dominated individual. Though she was visibly upset at her mother's overly zealous attitude she seemed to accept it as "fate." Even asking Rosita to perform a simple task with her child brought the response from the mother: "That's something that I do; I can always do it so much faster." It became quite obvious as the conversation developed that the mother wanted Rosita to give her baby up for adoption. "It's hard enough taking care of Rosita; I just don't have the time or money to care for two," was her feeling.

After about an hour's discussion Jodi and the social worker decided to leave and to come back when Rosita's mother was at work. That evening they returned and Rosita welcomed them. As the three talked Rosita confessed that she felt hampered by her mother. The mother had dominated Rosita ll her life and given her little freedom. Now her only joy was her child, Miguel. "He is a Godsend!" she kept saying. More than anything else Rosita wanted to raise him as her son. She hoped that Jodi could give her the training she needed in infant care. She said that her own blindness had given her a sensitivity to the problems of those without sight. She said she could feel the baby's problems, know what he was going through, and relate to the child better than anyone else. She also asked the social worker about a rehabilitation training program which she had mentioned earlier. She felt she finally had the incentive to learn a skill.

When Jodi and the social worker mentioned the father of the child, Rosita became silent. She did not wish to discuss the father. Rosita had developed several friendships in the building over the years, mostly as an escape from the domination of her mother. When residents would drop in during her mother's working hours to see how she was faring alone, she would strike up a conversation. Eventually, people would come to visit her.

Her mother had painted this picture quite differently. Rosita didn't have friends; she was a tramp, was what she said. The mother felt that the answer to Rosita's problems was not friendships in the building but a closer relationship with her mother.

Juan lives in the building two floors above Rosita. He is thirty, divorced, and currently unemployed. He is the father of Miguel.

Jodi has several alternatives. You are to work together as a group. Your task is to reach a group consensus on the rank order of the eight alternatives available to Jodi. First, select the alternative the group believes to be the best. Then select the second best. Continue until all the alternatives have been ranked.

1. A Spanish speaking nurse can best relate to Rosita and her child. Jodi should request that she be removed from the case and a Spanish speaking R. N. be her replacement.

2. In view of the child's and Rosita's handicaps Miguel should be placed out for adoption so that he can receive the best possible upbringing in a healthy environment.

3. Jodi should train Rosita in baby care. Particular emphasis should be given to the special methods for blind parents' handling of a child.

4. Rosita's needs and the possibilities for helping her daughter gain independence should be brought to the attention of her mother.

5. Rosita should be encouraged to take advantage of rehabilitative training so she can develop self-sufficient skills.

6. Rosita should be encouraged to become self-supportive and raise the child on her own away from the influence of her mother.

7. Attempts should be made to determine the father, encourage marriage, and establish a home for both the baby and Rosita.

8. As provided for under Illinois law contraceptive information and devices should be provided for Rosita through Jodi.

MEMBER QUESTIONNAIRE

Name _____

On the scale below each question, circle the number which best describes the way you see your participation in the case study discussion. Try to distinguish between those areas where you feel you rate high and those where you rate less well.

1. How effective do you think you were in contributing ideas, insights, and suggestions which helped the group solve problems and achieve its goals? (circle one)

6	5	4	3	2	1
exceptionally effective					very ineffective

2. How effective do you think you were in performing functions which built the group and kept it working well? (circle one)

6	5	4	3	2	1
exceptionally effective					very ineffective

3. In your opinion, how able were you to express yourself freely and comfortably in the group? (circle one)

6	5	4	3	2	1
exceptionally free and comfortable					very restricted and tense

4. To what extent were the minority views listened to with respect?

1. Most were disregarded or ignored.
2. Some were disregarded.
3. A few more were disregarded than given serious thought.
4. A few more were given serious thought than disregarded.
5. Some were given serious thought.
6. Most were given serious thought and consideration.

5. What did the group generally do when the group was confronted with differences in feelings and ideas?

   1. Denied there were any differences.
   2. Avoided discussion of apparent differences.
   3. Recognized differences but moved to other issues.
   4. Attempted to deal with differences but not openly.
   5. Faced conflicts but could not resolve them.
   6. Faced conflicts and worked them through.

6. To what extent were group members out to win their own points as opposed to considering the merits of the issues?

   1. Almost completely out to win own points.
   2. Moderately out to win own points.
   3. Slightly more out to win own points than to consider merits of issue.
   4. Slightly more considering merits of issues than out to win own points.
   5. Moderately considering merits of issues.
   6. Almost completely considering merits of issues.

7. To what extent did you have private thoughts and unexpressed feelings and opinions which you would not have felt comfortable bringing out in discussion.

   1. I felt almost completely under wraps.
   2. Somewhat under wraps.
   3. Slightly more under wraps than free and expressive.
   4. Slightly more free and expressive than under wraps.
   5. Somewhat free and expressive.
   6. I felt amost completely free and expressive.

8. How would you characterize the quality of communication in the group?

   1. Very poor, members don't listen to each other and don't understand at all.
   2. Poor, members listen and understand very little.
   3. Slightly more poor than good.
   4. Slightly more good than poor.
   5. Good, members listen some and understand.
   6. Very good, members really listen to each other and understand.

9. How would you characterize the intellectual level of problem-solving in the group discussion?

   1. Creative, imaginative, logical, critical -- can't imagine a better situation.
   2. Highly competent but lacking in some regards.
   3. Routine, ordinary level of problem-solving.
   4. Less than routine level.
   5. Quite incompetent but some good thinking.
   6. Flat, unimaginative, many illogical ideas, uncritical.

10. Did you get as much help as needed from other members of the group?

   1. No, they disregarded my needs completely.
   2. Disregarded quite a bit.
   3. More disregarded than recognized.
   4. More recognized than disregarded.
   5. Recognized quite a bit.
   6. Almost completely recognized my needs.

11. To what extent did you feel a real part of the discussion group?

   1. Completely a part of the group all the time.
   2. Mostly a part of the group.
   3. A little more a part of the group than outside.
   4. A little more outside the group than a part
   5. Mostly on the outside of the group.
   6. Completely on the outside, not part of the group at all.

INSTRUCTIONS

SCALING THE DIMENSIONS OF GROUP TASKS

Shaw (1963) devised a method for definitional comparison of groups by use of a task dimension scale. It appears to offer a partial solution to the needs of field study researchers in identifying and measuring the nature of tasks undertaken by groups.

Shaw identified those task dimensions which appear to have meaning independent of the particular group involved. He collected 104 different group tasks from experimental literature, from other investigators in the field, and from his own creative efforts. Task dimensions were then identified by trial and error quasi-logical processes, followed by two factor analyses.

The task dimensions thus derived are described by Shaw (1963, pp. 19-20) as follows:

I. Difficulty (Factor I) may be defined as the amount of effort required to complete the task. Difficulty is influenced by the number of operations, skills, and knowledges required for successful task completion. Goal clarity is negatively loaded on Factor I, and may be regarded as one aspect of difficulty. Tasks may vary on this dimension from easy, i.e., requiring few operations, skills, and knowledges, to difficult, i.e., requiring many operations, skills, and knowledges.

II. Solution Multiplicity (Factor II) may be defined as the degree to which there is more than one "correct" solution. This is a complex dimension involving number of acceptable solutions, number of alternatives for task completion, and the degree to which acceptable solutions can be verified (i.e., demonstrated to be correct). Solution Multiplicity was chosen as the label for this dimension not only because it had the heaviest factor loading, but also because the number of acceptable solutions appears to be a basic aspect of tasks. Thus, a task that has a high scale value on Solution Multiplicity is one that has many possible solutions that are acceptable, and no solution that can be easily

verified, whereas a task that has a low scale value on this dimension will have a single acceptable solution that can be easily demonstrated to be correct, and a single path leading to this goal.

III. Cooperation Requirements (Factor III) may be defined as the degree to which integrated action of group members is required to complete the task. Tasks at the high end of this continuum require that group members coordinate their actions so that each member is performing the proper function at the proper time relative to the actions of other members, whereas a task at the other extreme could be completed by each group member working independently and at his own speed.

IV. Intellectual-Manipulative Requirements (part of Factor IV) is defined as the ratio of mental requirements to motor requirements. It is retained as a separate dimension despite the fact that it had loadings on Factor IV in common with Population Familiarity. This decision is based upon the relatively low correlation between these two segments of Factor IV. Tasks at the high end of the dimension of Intellectual-Manipulative Requirements require only mental (reasoning, thinking) activities for completion, whereas those at the opposite extreme require only motor (physical) activities for successful task completion.

V. Population Familiarity (part of Factor IV) may be defined as the degree to which the task is encountered by members of the larger society. It is regarded as a separate dimension for the reasons given above, but appears to be a relatively weak dimension.

VI. Intrinsic Interest (Factor V) is defined as the degree to which the task in and of itself is interesting, motivating, or attractive to the group members.

The decision that a group has turned from one task to another task is situation bound and somewhat subjective. Observers may ask for the opinion of other observers or for the opinion of the group itself. The interaction of the group members, or the leadership behavior of one or more members may indicate that a new problem is now being considered. When it is clear to an observer that one or more of the above dimensions has changed, then a new task has replaced the one previously under consideration. In such a case, the new task should be identified by number and an appropriate descriptive name, and scaled by the observer on each of the above dimensions.

On the answer sheet provided, identify by number (in sequence) each task attempted by the group you are observing. Give each task thus identified a descriptive name, and rate it from 1 to 5 on the following scales. Put your ratings for each task in the appropriate boxes below each dimension as indentified, and opposite each task number and name. Write only on the answer sheet provided; use this sheet only for reference purposes. Use the following scales for deriving the numbers which you put in the boxes in the answer sheet.

I. Difficulty: amount of effort required to complete the task:

1	2	3	4	5
very easy	easy	neither easy nor difficult	difficult	very difficult

II. Solution Multiplicity: degree to which there is more than one "Correct" solution:

1	2	3	4	5
clearly only one	probably only one	perhaps more than one	probably more than one	clearly more than one

III. Cooperation Requirements: degree to which integrated action of group members is required to complete the task:

1	2	3	4	5
not required	probably not required	perhaps helpful	probably required	required

IV. Intellectual-Manipulative Requirements: ratio of mental requirements to motor requirements:

1	2	3	4	5
motor only	more motor than mental	about equal motor and mental	more mental than motor	mental only

V. Population Familiarity: degree to which the task is familiar to members of the larger society:

1	2	3	4	5
familiar to none	familiar to a few	familiar to some	familiar to many	familiar to all

VI. Intrinsic Interest: degree to which the task in and of itself appears to be interesting to the group members:

1	2	3	4	5
not interesting	slightly interesting	fairly interesting	very interesting	extremely interesting

ANSWER SHEET FOR SCALING GROUP DIMENSIONS

Date _____

Name _____

Name or Code Number of Group _____

GROUP TASKS (number & name)	DIMENSIONS (put appropriate ratings in each box)					
(Descriptive name for each group task identified)	I difficulty	II solution multiplicity	III cooperation requirements	IV intellectual - manipulative	V population familiarity	VI intrinsic interest
1						
2						
3						
4						
5						
6						
7						
8						
9						
10						
11						
12						

Decision-Making Procedures Check List

Use this list to check the actual procedures used for making decisions during each task of this meeting.

9 Thought and feeling consensus (Unanimity)

8 Near consensus: (Either with reservation - "I'll go along" - or dissent of one or two)

7 Problem census: (Brainstorming followed by selection from alternatives)

6 Majority support: (One or two more than half give support)

5 Minority support: (Majority tacit agreement or lack of disagreement)

4 Handclasp: (Support of one or two members leads to action)

3 Topic jump: (Drifting or shifting of topic without explicit deliberation and decision)

2 Self-authorized decision: (One person initiates and action follows by implicit consent or no overt disagreement)

1 Plop: (Suggestion failed to be picked up resulting in decision not to consider proposal)

The Leveling Scale

Use this scale to indicate how open or closed you were about exposing your feelings. On the summary answer sheet put a rating for each task. Use the following scale:

1	2	3	4	↓ 5	6	7	8	9
Completely Closed				Partially Open				Completely Open

Completely Closed would indicate that you had definite feelings or opinions about the topic under discussion, but for one reason or another you did not expose those feelings.

Completely Open would indicate that you had expressed fully all your feelings about the topic under discussion as well as any feelings or emotions toward other members of your group.

You may rate any topic with an NF indicating that you had no feelings, opinions, or emotions connected with this topic.

THE UNIVERSITY OF WISCONSIN
Department of Curriculum and Instruction

DATE _____ NAME _____

CODE LETTER OF GROUP _____

Decision-Making Procedures		Leveling Scale
Task Number (from Shaw Scale)	Procedure Rating (from Decision-Making Procedures Check List)	Leveling (from Leveling Scale)

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